UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

3D SYSTEMS, INC.,	)	
	)	
Plaintiff,	)	
	)	Case No. 2:05-cv-74891
v.	)	
	)	Hon. Avern Cohn
ENVISIONTEC, INC., ENVISIONTEC GMBH, and **SIBCO, INC.**,	)	Magistrate Judge Hon. R. Steven Whalen
	)	
Defendants.	)	
	)	

DEFENDANTS' CLAIM CONSTRUCTION BRIEF

Pursuant to the Court's Pretrial Order No. 2, dated January 17, 2007, as amended on March 1, 2007, Defendants Envisiontec, Inc., Envisiontec GmbH, and Sibco, Inc. ("Defendants") hereby submit their claim construction brief in support of their interpretations of the disputed claim terms in Plaintiff 3D Systems, Inc.'s ("3D") paradigm patents.

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INTRODUCTION

The four paradigm patents are each directed to "stereolithography," a process that creates solid objects by moving a radiation beam (such as a laser beam) across the surface of a curable liquid to sequentially "draw" a series of radiation patterns, thereby forming adjacent layers of the object in succession. As 3D apparently concedes, the four paradigm claims are all susceptible to construction via the intrinsic record (the claim language, specification, and file history). However, the parties differ as to the correct construction of numerous claim terms. Under controlling Federal Circuit precedent, specification statements that characterize "the invention" or which otherwise describe critical features of the claimed invention limit the scope of a patentee's claims. Yet, 3D's constructions ignore such limiting statements, including those that limit each of the paradigm patents to stereolithography.

3D has repeatedly used its stereolithography patent arsenal to crush its competitors, including the now-defunct Aaroflex. In the Aaroflex suit, 3D admitted that the stereolithography process is defined by the use of a radiation beam that draws a radiation pattern as it moves across the surface of a curable liquid. 3D also admitted that stereolithography is defined by the use of "sliced" object data to drive the movement of the radiation beam. Now seeking to crush Envisiontec-- a different competitor with its own unique and patented technology--3D seeks claim constructions that cannot be reconciled with its earlier admissions.

Having been allowed to conduct both written and deposition discovery of Defendants' products, 3D's constructions were strategically crafted to support its infringement assertions. However, given their lack of support by the intrinsic evidence, 3D's constructions should be rejected, and Defendants' constructions should be adopted. Defendants' and 3D's constructions are set forth in summary form in Exhibit 1.

I. TECHNOLOGY BACKGROUND

Each of the asserted paradigm patents[1] is directed to "stereolithography." In an earlier suit against one of its former competitors--Aaroflex--3D defined stereolithography as follows:

> A stereolithography system creates three-dimensional objects, layer by layer. The process takes place under the control of a computer, which receives data describing the three-dimensional object to be built and "slices" it to produce data describing cross-sections. That data is then used to direct an ultraviolet laser, whose beam solidifies the surface of a photosensitive liquid. The partial object is then lowered beneath the liquid surface, and the process repeats using data from the next higher slice. Hundreds or thousands of layers later, the object is complete.[2]

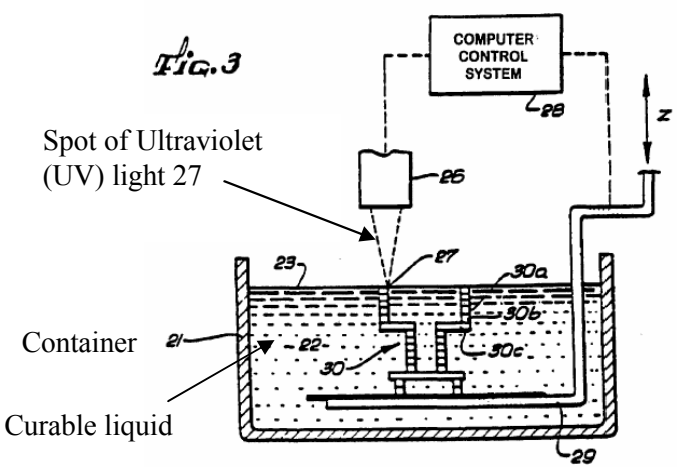
The four paradigm patents are directed to different aspects of the stereolithography process. The '981 Patent is directed to the basic stereolithography process. The '537 Patent concerns the use of an applicator connected to a vacuum pump to "recoat" fresh curable liquid over previously solidified object layers. The '934 Patent concerns a "smoothing element" with substantially separate members, and the '143 Patent concerns "removable supports." A brief discussion of the each paradigm patent is provided below.

A. The Basic Stereolithography Process (the "'981 Patent")

An exemplary stereolithographic apparatus is depicted in FIG. 3 of the '981 Patent:

[1] The paradigm patents are: 1) Hull, U. S. Patent No. 5,630,981, entitled "Method for Production of Three-Dimensional Objects by Stereolithography" (the "'981 Patent") (Exh. 2); 2) Almquist, et al., U.S. Patent No. 5,651,934, entitled "Recoating of Stereolithographic Layers" (the "'934 Patent") (Exh. 3); 3) Almquist, et al., U.S. Patent No. 5,902,537, entitled "Rapid Recoating of Three-Dimensional Objects Formed On a Cross-Sectional Basis" (the "'537 Patent") (Exh. 4); and 4) Hull, et al., U.S. Patent No. 4,999,143, entitled "Methods and Apparatus for Production of Three-Dimensional Objects by Stereolithography" (the "'143 Patent")(Exh. 5).

[2] Trial Brief of Plaintiff 3D Systems, Inc. from *3D Systems, Inc. v. Aaroflex, Inc.* (Case No. CV 97-0231 AJW), dated July 9, 2002 at 1 ("3D's Aaroflex Trial Brief") (Exh. 6).



As FIG. 3 indicates, container 21 contains a photocurable liquid 22 (i.e., a liquid that can be polymerized or cross-linked to solidify upon exposure to light). The '981 Patent describes the curing process as follows:

> The light source 26 produces the spot 27 of UV light small enough to allow the desired object detail to be formed, and intense enough to cure the UV curable liquid being used quickly enough to be practical. The source 26 is arranged so it can be programmed to be turned off and on, and to move, such that the focused spot 27 moves across the surface 23 of the liquid 22. Thus, as the spot 27 moves, it cures the liquid 22 into a solid, and "draws" a solid pattern on the surface in much the same way a chart recorder or plotter uses a pen to draw a pattern on paper.

The '981 Patent at 7:20-30 (Exh. 2).

"As the liquid cures and solid material forms, the elevator platform 29 that was initially just below surface 23 is moved down from the surface in a programmed manner by any suitable actuator." *Id.* at 6:45-48. "The light source 26 for the presently preferred embodiment of a stereolithograph is made using a 350 watt mercury short arc lamp in a housing, with the light output of the housing focused on the end of a 1mm diameter UV transmitting fiber optic bundle (not shown)." *Id.* at 7:30-34. To drive the light source, a digital plotter is used. *Id.* at 7:59-61. While other processes for making three-dimensional parts are mentioned, the '981 Patent states

that the *invention* is limited to the use of processes in which a radiation pattern is drawn across the surface of the curable liquid:

> [W]hile a variety of stereolithographic systems have been disclosed for the practice of the present invention, they all have in common the concept of drawing upon a substantially two-dimensional surface and extracting a three-dimensional object from that surface.

Id. at 12:9-14.

As FIG. 3 also indicates, the stereolithographic process uses a computer 28. The function of the computer is to convert a representation of the object being built into commands that dictate how the UV light pattern is drawn for each specific layer:

> The computer 28 in the stereolithographic system of the present invention has two basic functions. The first is to help the operator design the three-dimensional object in a way that it can be made. The second is to translate the design into commands that are appropriate for the other stereolithographic components, and to deliver these commands in a way so that the object is formed. In some applications, the object design will exist, and the only function of the computer will be to deliver the appropriate commands.

Id. at 8:25-33.

After each layer of the object is drawn, the elevator platform 29 moves downward to initiate "recoating" of fresh curable liquid. Specific recoating processes are the subject of the '934 and '537 Patents, which will be discussed below. However, the '981 describes a recoating process that is sometimes referred to as "deep dipping":

> Typically, after a layer is formed, the object 30 is moved beyond the level of the next layer to allow the liquid 22 to flow into the momentary void at surface 23 left where the solid was formed, and then it is moved back to the correct level for the next layer.

Id. at 8:8-12.

B. Doctor Blade Recoating (the '934 Patent)

In 3D's stereolithographic process, after a layer of photocurable liquid is cured, a new

layer of uncured liquid must be supplied, a process called "recoating." To ensure proper object formation, the new layer must be sufficiently smooth. Because of the viscosity of typical photocurable liquids, it can take a considerable amount of time for gravity to level the liquid, resulting in longer object build times. The '934 Patent's Background of the Invention describes the problem as follows:

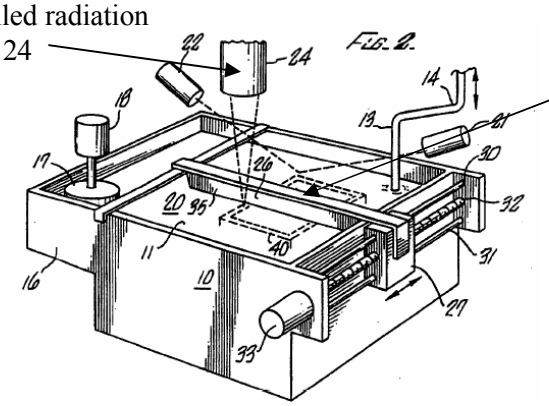
> In typical stereolithographic procedures, a thin layer of viscous curable plastic liquid is applied to a surface which may be a previously cured layer and, after sufficient time has elapsed for the thin layer of polymerizable liquid to smooth out by gravity, a computer controlled beam of radiation is moved across the thin liquid layer to sufficiently cure the plastic liquid so that subsequent layers can be applied thereto. The waiting period for the thin layer to level varies depending on several factors such as the viscosity of the polymerizable liquid, the layer thickness, part geometry, and cross-section and the like.

The '934 Patent at 1:66-2:9 (Exh. 3).

"[S]tereolithographic machines require very precise control of the level of the working fluid." *Id.* at 4:49-50. "[T]he level of working fluid must be maintained at a constant level so that the beam of U.V. light will remain sharply in focus on a fixed plane." *Id*. at 4:56-59.

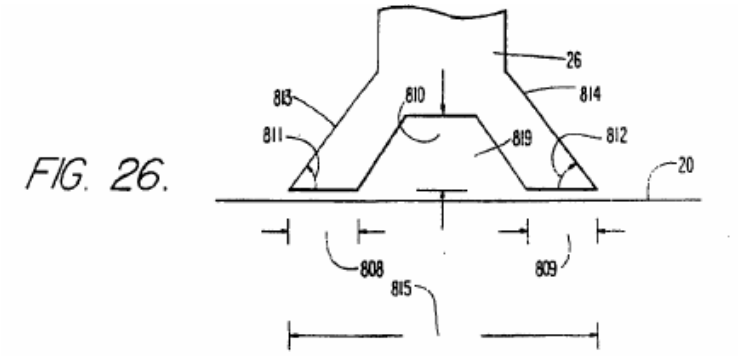
"[D]octor blades provide means to reduce the cycle time for forming each layer of plastic . . . ." *Id.* at 3:40-41. However, the '934 Patent describes numerous deficiencies of previous doctor blades. *Id.* at 3:40-5:52. To address these deficiencies, the patent describes several purported "improvements," including in the design and use of doctor blades. An embodiment of a stereolithography device using a doctor blade is provided in FIG. 2 of the '934 Patent:

Computer controlled radiation source 24



"Doctor blade 26 is moved horizontally so that the lower edge 35 thereof strikes off excess polymerizable liquid from the layer 34 and thereby smoothes the upper surface (36) of the coating . . . ."
The '934 Patent at 8:58-62 (Exh. 3).

The paradigm claim that 3D has selected from the '934 Patent (claim 2) recites the use of a "smoothing element" having a "plurality of substantially separate members" and comprising a "winged blade." FIG. 26 depicts an embodiment of a "winged blade" as follows:



The '934 Patent describes the "winged blade" embodiment as follows:

> As shown, the preferred embodiment has two wings, identified with reference numerals 813 and 814, having sides which are at angles 811 and 812, respectively, with resin surface 20. Preferably, angles 811 and 812 are about 30°.
>
> Dimensions 808 and 809 should each be less than about 0.060 in., and preferably about 0.030 in. or less, and dimension 810 should be at least 0.010 in. or more, and preferably about 0.030 in. If dimensions 808 and 809 are too large, or if dimension 810 is too small, then layer uniformity is adversely affected. Large values of dimensions 808 and 809, or alternatively, small values of dimension 810, can result in too much

> blade/resin surface contact, which can induce a lift or drag force on the part, and can lead to blade/part contact for the reasons discussed previously.
>
> Dimension 815 should be greater than 0.375 in., and preferably about 0.5 to 0.75 in.
>
> This embodiment considerably reduces the leading edge deposit problem relative to simple vertical blades, and is also capable of uniform recoating of thin (0.003 to 0.005 in.) layers.

Id. at 233:49-233:67.

The smoothing element depicted in the '934 Patent does not deposit any liquid as it crosses the tank. Instead, it merely strikes off excess liquid to create a uniform level. As will be seen below, the '537 Patent is directed to the use of an "applicator" which both dispenses liquid and smoothes the surface of the liquid level.

C. Vacuum Recoating ('537 Patent)

The '537 Patent also deals with the issue of stereolithographic recoating. According to the Background of the Invention, "The [] invention is directed primarily to . . . coating a building material layer adjacent to a previously formed object cross-section in preparation for forming a subsequent object cross-section." The '537 Patent at 2:36-39 (Exh. 4). According to the patent, "prior approaches have resulted in varying degrees of layer accuracy and non-uniformity, and/or have required excessive time to form the coatings . . . ." *Id.* at 2:42-45. Notably, the '534 Patent *criticizes* the doctor blade approach of the '934 Patent, stating that the "doctor blade approach . . . typically involves sweeping a bar or other device across the surface of a building material layer, thereby smoothing it. Though this may reduce coating time, other problems remain such as those associated with leading edge bulge, trapped volumes, scoop-out and other problems . . . ." *Id.* at 3:44-49. Like the '934 Patent, the '537 Patent emphasizes that "it is important that the building

material layer is uniform and of appropriate thickness so that upon solidification, the resulting object cross-section exhibits dimensional accuracy." *Id.* at 2:47-50.

3D's paradigm claim from the '537 Patent (claim 81) recites the use of "an applicator" and "a vacuum pump coupled to the applicator." Figures 9a and 9b of the '537 Patent depict an embodiment of a stereolithographic rapid recoating system both prior to (FIG. 9a) and during (FIG. 9b) the dispensing of material by an applicator:

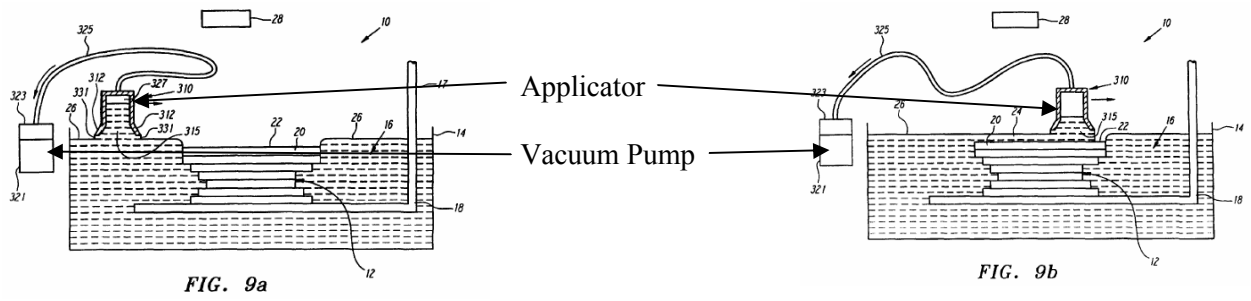


FIG. 9a FIG. 9b

The '537 Patent describes the recoating process as follows:

> [A]pplicator 310 simultaneously applies and smoothes a building material layer 24. In a first preferred embodiment of this technique, after the last formed object cross-section 20 has been formed by selectively exposing the building material to synergistic stimulation, object 12 is dipped one layer thickness, or other desired thickness, below the desired working surface 26 of building material 16. During the exposure process, applicator 310 is at least partially filled with material 16 and after the exposure process, applicator 310 is swept at or slightly above the desired working surface 26 while dispensing material from opening 315 to form building material layer 24. After the dispensing of material 16, the vertical position of the upper surface 22 of the last formed object cross-section 20 may be adjusted if necessary so that it is essentially one layer or other desired thickness below the desired working surface 26.

The '537 Patent at 37:48-64 (Exh. 4).

According to the '537 Patent, the vacuum pump is used to draw liquid up into the applicator:

> In this first preferred embodiment, the resin volume in applicator 310 is maintained by vacuum pump 321, pressure regulator 323, and vacuum feed line

> 325. The application of vacuum through line 325 into the upper portion of cavity 327 of applicator 310 causes a pressure differential to occur between the inside of cavity 327 and the region outside applicator 310. Applicator 310 is sealed with the exception of one or more openings near its top and with the further exception of opening 315 at its bottom. The openings near the top of applicator 310 provide for connection to vacuum feed line 325, while the opening at the bottom forms a slit for applicator 310 to receive and dispense building material 16.

Id. at 38:20-32.

As FIGS. 9a and 9b illustrate, applicator 310 dispenses uniformly thick layers of photocurable liquid 16. Further, a "meniscus" 331 forms and bridges a gap between the working surface 26 of the photocurable liquid and the bottom of applicator 310. The meniscus seals the applicator, and "as the pressure differential forms due to application of a vacuum at the top of the applicator 310, building material will be drawn up into applicator 310 until the pressure differential outside and inside applicator 310 is zero." *Id.* at 38:39-45.

D. Removable Supports (the '143 Patent)

According to the '143 Patent, "Stereolithography parts are preferably built on structures known as supports, rather than directly on the elevator platform." The '143 Patent at 8:12-13 (Exh. 5). The Background of the Invention explains that certain prior art supports (posts) were limited by their strength and the required curing time. *Id.* at 3:14-20. It also explains that other supports (polygonal) were used but that "(1) they were hard to remove from the object, (2) they offered support to only a limited number of object vectors, and (3) this type of support required the use of a base to support the polygons to insure attachment of the perforated platform." *Id.* at 3:37-41. To address the problems in the prior art, the '143 Patent states that "In accordance with the invention, supports are provided in the form of 'WEBS.' Webs, in cross-section are long slender rectangular structures." *Id.* at 6:52-54. "The width of a web is designed thin enough to be easy to remove from the part after post curing. The length of a web is designed to meet two

requirements: (1) long enough to give good adhesion to the elevator platform (without need of a base), and (2) long enough to span the cross-section of the object (to give support to cross-hatch and the boundaries enclosing it)." *Id.* at 6:56-61.

FIG. 9 depicts an embodiment of supports:

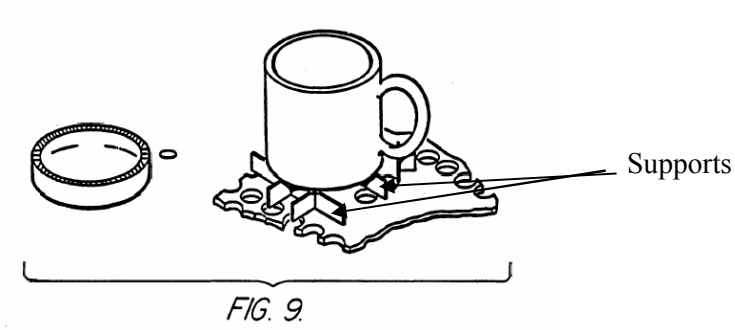


FIG. 9.

"Generally, supports are designed as a single CAD [computer-aided design] file separate from the part file." The '143 Patent at 16:24-25 (Exh. 5). "The object and support files are merged and drawn as a single file later in the stereolithography process." *Id*. at 16:27-29. Along with the data file for the part itself, the support files are "sliced" in a computer known as a "Slice Computer." "SLICE defines each microsection or layer one at a time." *Id.* at 13:56-57. The following figure describes how the supports and part are built, sliced, and integrated with the object to drive the moving radiation beam and cure the photocurable liquid:

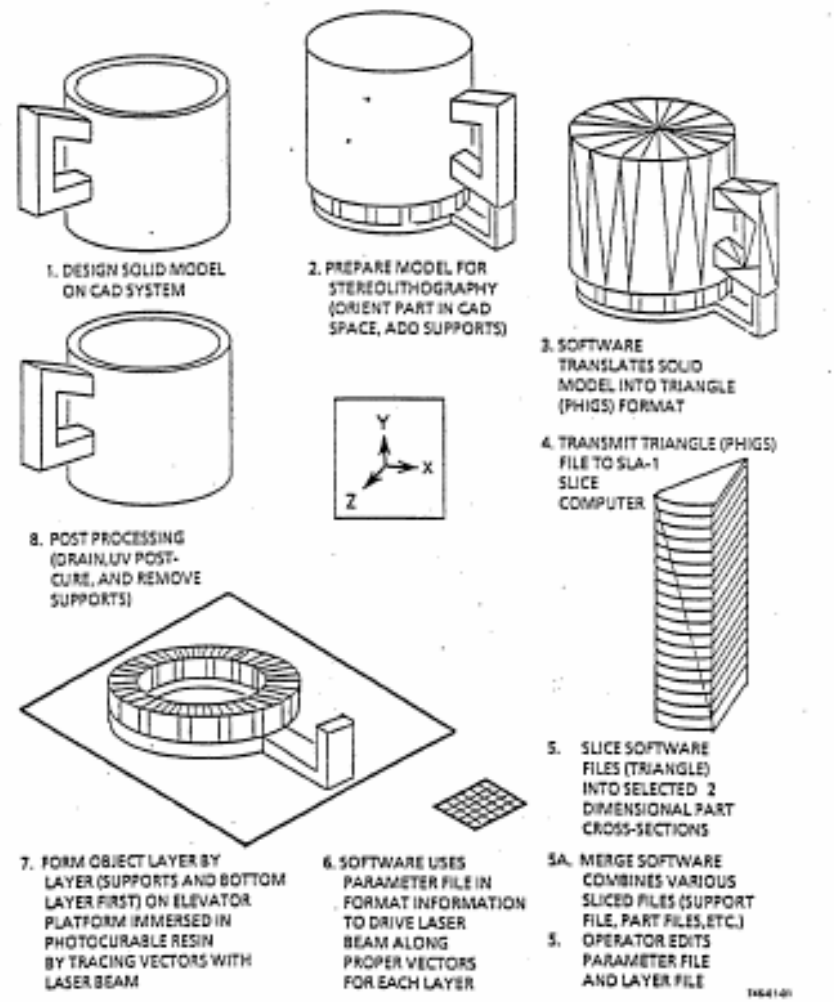
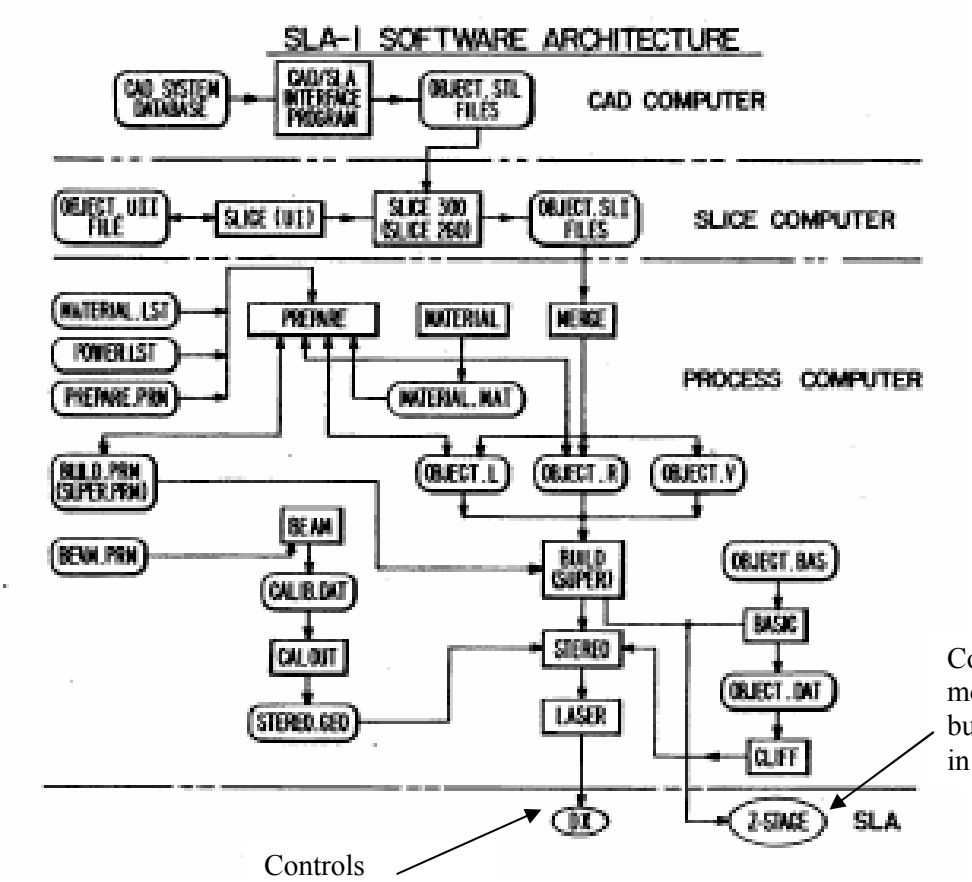


Figure 1-1. Key Steps in the Stereolithography Process

The '143 Patent at cols. 39-40 (Exh. 5). As the foregoing indicates, after the user adds supports to the model in step 2, the part and support files are "sliced" into uniformly thick, horizontal slices which are then merged in step 5A. The sliced files are then used to calculate vectors that dictate the pattern that is traced by the moving radiation beam, in this case a laser beam. As depicted in FIG. 6, the support and part files are first generated in a user CAD computer. Once generated, the support and part files are transferred to a slice computer where the slicing operation depicted above is performed. The sliced files are then transferred to a

process computer, where they are merged and converted into vectors used to drive the stereolithographic apparatus ("SLA"):



The '143 Patent at cols. 37-38 and 41-44 (Exh. 5). *See also*, U.S. Patent No. 5,015,424[3] (the "'424 Patent," Exh. 7) at 6:46-54 ("The [stereolithographic apparatus] then forms the object one horizontal layer at a time by moving the ultraviolet beam . . . and solidifying the liquid

[3] The '424 Patent is incorporated by reference in the '143 Patent. The '143 Patent at 1:29 (Exh. 5) (identifying Application 07/183,015 which issued as the '424 Patent).

where it strikes"); *see also, Id.* at 6:52-54 ("Each layer is comprised of vectors which are typically drawn in the following order: border, hatch, and surface").

II. LEGAL PRINCIPLES GOVERNING CLAIM CONSTRUCTION

"The construction of a patent . . . is exclusively within the province of the court." *Markman, et al., v. Westview Instruments, Inc., et al.,* 517 U.S. 370, 371, 116 S. Ct. 1384, 1387 (1996). "[T]he words of a claim are generally given their ordinary and customary meaning." *Phillips v. AWH Corp., et al.,* 415 F.3d 1303, 1312 (Fed. Cir. 2005) (citations omitted). "[T]he court looks to those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean." *Id*. at 1314 (citations omitted). "Those sources include the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id*. (citations omitted).

As 3D concedes, it is proper to use the specification to define claim language. While it is generally improper to import limitations into a claim, the Federal Circuit has distinguished situations where the patentee is setting out specific examples of the invention versus situations in which the specification acts to implicitly limit the scope of a patentee's claims. For example, in *Honeywell International, Inc., et al., v. ITT Industries, Inc., et al.,* 452 F.3d 1312 (Fed. Cir. 2006), the Federal Circuit affirmed a claim construction that limited the term "fuel injection system component" to a "fuel filter," noting that the written description repeatedly referred to a fuel filter as "the invention." *Id*. at 1318. The Court held that "where the specification makes clear that the invention does not include a particular feature, that feature is deemed to be outside the reach of the claims of the patent, even though the language of the claims, read without reference to the specification, might be considered broad enough to encompass the feature in

question." *Id*. at 1319, citing *Scimed Life Sys. v. Advanced Cardiovascular Sys.,* 242 F.3d 1337, 1341 (Fed. Cir. 1991). Similarly, in its recent opinion in *Andersen Corp. v. Fiber Composites, LLC*, 2007 US App. LEXIS 3108 (Fed. Cir. 2007), the Federal Circuit held that specification features that are described as critical elements will limit the scope of a patentee's claims. *Id*. at *10-12 ("The Group I common specification repeatedly states that the steps of linear extrusion or pelletization are not merely embodiments, but are essential features of the claimed composite composition").

In construing claim language, courts must not construe claims so broadly that they would not satisfy the written description and/or enablement requirements of 35 U.S.C. § 112. "In order to be covered by the claims, [ ] subject matter must be sufficiently described as the applicant's invention to meet the requirements of section 112." *Wang Laboratories, Inc. v. America Online, Inc., et al.,* 197 F.3d 1377, 1383 (Fed. Cir. 1999). "[C]laims are not properly construed to have a meaning or scope that would lead to their invalidity for failure to satisfy the requirements of patentability." *Id*. *See also*, *The Gentry Gallery, Inc. v. The Berkline Corp.*, 134 F.3d 1473, 1480 (Fed. Cir. 1998) ("[C]laims may be no broader than the supporting disclosure").

III. DEFENDANTS' CLAIM CONSTRUCTIONS

A. The '981 Patent (Claim 11)

The asserted paradigm claim from the '981 Patent is claim 11.[4] Defendants' constructions of the disputed limitations of claim 11 are set forth below.

[4] Claim 11 is a dependent claim based on claim 10.

1. "**Producing a Three-Dimensional Object**"

This phrase should be construed to mean "**moving a beam of radiation across the surface of a curable liquid to create a solid object by drawing a radiation pattern thereon**." As 3D admits, "[w]hen a specification describes a particular feature as always present in the invention, the corresponding limitation *must be interpreted as limited* to the disclosed feature."[5] The '981 Patent is replete with statements indicating that the claimed invention is limited to stereolithography and that stereolithography is limited to the use of radiation beams that draw a radiation pattern as they move across the surface of a curable liquid. Tellingly, 3D ignores these statements in its claim chart. Moreover, in its prior suit against Aaroflex, 3D defined "stereolithography" as a process in which "data describing cross-sections . . . **direct[s] an ultraviolet laser, whose beam solidifies the surface of the photosensitive liquid**." 3D's Aaroflex Trial Brief at 1 (Exh. 6) (emphasis added).

The '981 Patent's Background of the Invention states that "this invention relates . . . more particularly to stereolithography." The '981 Patent at 1:21-27 (Exh. 2). The Summary of the Invention states that "The present invention harnesses the principles of computer generated graphics in combination with stereolithography" and then goes on to describe stereolithography, as follows: "A programmed movable spot beam of UV light shining on a surface or layer of UV curable liquid is used to form a solid cross-section of the object at the surface of the liquid." *Id.* at 2:48-51. Elsewhere, 3D states "This invention, referred to as stereolithography" and refers to "the stereolithographic system of the present invention." *Id*. at 5:2-3 and 5:13-14. *See also*, *Id.* at 5:6-7 ("the stereolithographic method of the present invention").

[5] 3D's Proposed Jury Instructions from *3D Systems, Inc. v. Aaroflex, Inc.* (Case No. 97-0231 AJW) (C.D. Cal.), dated October 9, 2002 ("3D's Aaroflex Jury Instructions") at 3-4 (Exh. 8) (emphasis added).

More importantly, the '981 Patent expressly limits the scope of its claims to "drawing" processes (i.e., processes that sequentially traverse locations of the curable liquid with a moving beam of radiation):

> It will be apparent from the foregoing that, while a variety of stereolithographic systems have been disclosed for the practice of the present invention, ***they all have*** in common the concept of ***drawing upon a substantially two-dimensional surface*** and extracting a three-dimensional object from that surface.

Id. at 12:9-14.

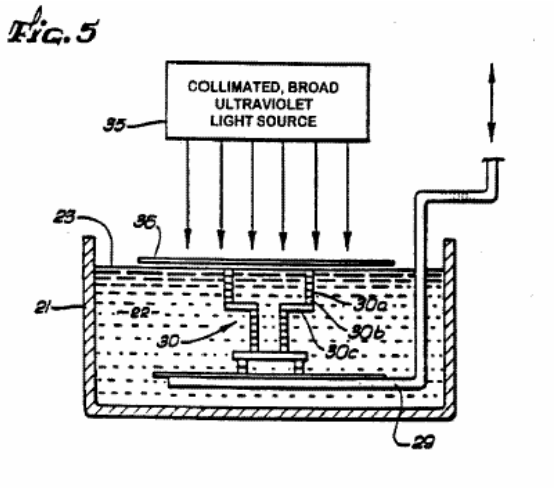
"That characterization of the invention cannot reasonably be interpreted to the preferred embodiment . . . but is expressly made applicable to 'all embodiments of the present invention.'" *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1344 (Fed. Cir. 2001). The facts of *Honeywell International, Inc., et al., v. ITT Industries Corp.,* 452 F.3d 1312 (Fed. Cir. 2006) are directly analogous. In *Honeywell,* the Federal Circuit limited the claim term "fuel system component" to cover only a "fuel filter." In arriving at its decision, the Court relied heavily on limiting specification statements regarding the "invention," such as "This invention relates to a fuel filter . . . . " *Id.* at 1318. Likewise, in the '981 Patent 3D repeatedly refers to "the invention" as stereolithography and consistently defines stereolithography as using a moving radiation beam to draw a radiation pattern across the surface of a curable liquid.

The file history contains similar statements indicating that "producing a three-dimensional object" is limited to stereolithography. For example, the patent application that issued as the '981 Patent claims priority to U.S. Patent Application No. 06/792,979 (the "'979 App."). As the Federal Circuit has held, the file history from a "parent" or earlier application in a priority chain of applications is relevant for purposes of construing claim language. "[P]rosecution disclaimer may arise from disavowals made during the prosecution of ancestor

patent applications." *Omega Engineering Inc., v. Raytek Corporation, et al.,* 334 F.3d 1314, 1333 (Fed. Cir. 2003). "[A]n interpretation asserted in the prosecution of a parent application can also affect continuation applications." *Id.* In responding to an Office Action for the '979 App., 3D distinguished the prior art by arguing that the "stereolithographic method of the present invention has many advantages over currently used methods for producing plastic objects." Amendment, dated April 15, 1987 at 6 (Exh. 9). 3D further argued that "in the practice of the present invention," "a spot of UV light or the like, is applied as a graphic pattern at the specified working surface of the fluid medium." *Id*. at 5.

3D's construction of "producing a three-dimensional object" is "producing a product, prototype, or model to be made which has three-dimensions." 3D's construction is flawed for several reasons. First, it is tautological and essentially defines the term "producing" as "producing." Second, it ignores the foregoing specification and file history references which clearly limit the scope of the claims to stereolithography. "Those statements serve to limit the scope of applicant's claimed subject matter. The statements about [stereolithography] were global--they applied to all the claims of the patent--and thus they served to limit all the claims." *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *18 (Fed. Cir. 2007).

3D may attempt to argue that Defendants' claim construction is inconsistent with the "mask exposure" system of Figure 5. However, by repeatedly stating that the claimed invention is limited to stereolithography, 3D indicated that the claims are not intended to cover the embodiment of Figure 5. "The public is entitled to take the patentee at his word and the word was that the invention is [stereolithography]." *Honeywell International, Inc., et al., v. ITT Industries, Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006). At most, the mask exposure system of Figure 5 is an *unclaimed* system:



The system of FIG. 5 is described as follows:

> The system of FIG. 5 is similar to that of FIG. 3, but the movable UV light source 26 is eliminated and a collimated, broad UV light source 35 and suitable apertured mask 36 is substituted for the programmed source 26 and focused spot 27. The apertured mask 36 is placed as close as possible to the working surface 23, and collimated light from the UV source 35 passes through the mask 36 to expose the working surface 23, thereby creating successive adjacent laminae, as in the embodiments of FIGS. 3 and 4. However, the use of a fixed mask 36 provides three-dimensional objects with a constant cross-sectional shape. **Whenever that cross-sectional shape is to be changed, a new mask 36 for that particular cross-sectional shape must be substituted and properly aligned. Of course, the masks can be automatically changed by providing a web of masks (not shown) which are successively moved into alignment with the surface 23**.

The '981 at 9:61-10:9 (Exh. 2) (emphasis added).

The language of claim 11 makes clear that the system depicted in Figure 5 is *not* an embodiment of the claim. Claim 11 recites "providing data representing the three-dimensional object which was generated on a CAD system" and further recites "exposing said medium . . . in response to said data." Nowhere, does the '981 Patent mention the use of CAD data to generate apertured masks, much less how it could be done. As depicted above, Figure 5 *does not* depict a CAD system (i.e., no computer is shown); nor does its corresponding description reference the

use of a CAD system. Thus, Figure 5 is *not* an embodiment of claim 11, and a construction that excludes Figure 5 *is* appropriate.

In addition, a construction of claim 11 that encompasses the mask exposure system of Figure 5 would be non-enabled, and therefore, improper. To build a solid object, the system of Figure 5 requires some means for automatically changing web masks to define the object's various cross-sections. No such system is described anywhere in the '981 Patent. "[I]n order to be covered by the claims [ ] subject matter must be sufficiently described as the applicant's invention to meet the requirements of section 112." *Wang Laboratories, Inc. v. America Online, Inc.*, 197 F.3d 1377, 1383 (Fed. Cir. 1999). To expand claim 11 to cover the system of Figure 5 would render claim 11 invalid for lack of enablement under 35 U.S.C. § 112. Such a construction is therefore improper.

Although issued as a non-precedential opinion, the Federal Circuit's recent decision in *Medtronic Navigation, Inc., et al., v. Brainlab Medzinische Computersysteme GmbH, et al.,* 2007 U.S. App. LEXIS 2521 (Fed. Cir. 2007) is on-point. In *Medtronic*, the patent-in-suit was directed to a system for indicating the position of surgical probe within a patient's head. At issue was whether the claim language "establishing the spatial relationship" properly *excluded* an "optical reference system," notwithstanding the fact that the specification said "an optical system can be used." *Medtronic*, 2007 US App. LEXIS 2521 at *8-*10. The Federal Circuit affirmed the District Court's exclusion of optical reference systems, holding that "this passing reference to an optical tracking system fails to support an interpretation broader than that adopted by the court" because "[t]here is no enabling description of how to make and use an optical tracking system, and claims are best construed to preserve their validity." *Id.* at *10-*11; *See also Wang*

Laboratories, 197 F.3d at 1383 ("claims are not properly construed to have a meaning or scope that would lead to their invalidity for failure to satisfy the requirements of patentability").

"It is difficult to imagine how the ['981] patent[ ] could have been clearer in making the point that [stereolithography] was a necessary element of every variant of the claimed invention." *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1344 (Fed. Cir. 2001). Thus, the phrase "producing a three-dimensional object" is necessarily limited to and construed in accordance with the meaning of stereolithography.

2. **"Subjected to Prescribed Radiation"**

As explained in detail in Section III.A.1, above, the '981 Patent's specification and file history make clear that claim 11 is necessarily limited to the use of radiation beams that draw a radiation pattern on the surface of a curable liquid as they move across it. This limitation directly affects the proper meaning of the phrase "subjected to prescribed radiation," which should therefore be construed to mean "**having a radiation pattern drawn at selected locations on the surface thereof with a beam of radiation that moves across the surface of the curable liquid**."

3D's proposed construction of this phrase is "exposed to predetermined (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams, to cause the building material to transform into a solidified state." 3D's construction is improper. First, it fails to account for the numerous instances where the '981 Patent specification limits the manner in which the medium is subjected to prescribed radiation as well as the nature of the prescribed radiation (i.e., the use of processes that "draw" a radiation pattern with a moving radiation beam). Second, 3D offers no support for its substitution of the word "exposed" for the claim term "subjected." Third, the claim's use of the

word "prescribed" refers to the fact that the radiation beam strikes specific locations on the curable liquid based on the cross-section being drawn. 3D's construction does not provide clear guidance on this point and instead merely states that the radiation is "predetermined" in some unspecified fashion.

3. **"Providing Said Prescribed Radiation"**

As explained in detail in Sections III.A.1 and III.A.2, above, the '981 Patent's specification and file history make clear that claim 11 is necessarily limited to the use of radiation beams that draw a radiation pattern as they move across the surface of a curable liquid. Accordingly, the phrase "providing said prescribed radiation" should be construed to mean "**providing the beam of radiation which is configured to move across the surface of the curable liquid and draw a pattern of radiation at selected locations thereon**." 3D's construction is similar to its construction of "subjected to prescribed radiation" and should be rejected for the reasons provided above in Sections III.A.1 and III A.2.

4. **"Providing Data Representing the Three-Dimensional Object"**

This phrase should be construed to mean "**supplying an object representation comprising horizontally-sliced object sections of constant thickness**." As discussed above, the '981 Patent is replete with statements limiting the invention to "stereolithography." As 3D has admitted, the stereolithography process uses ***sliced*** data to represent the object being built:

> A stereolithography system creates three-dimensional objects, layer by layer. The process takes place under the control of a computer, **which receives data describing the three-dimensional object to be built and "slices" it to produce data describing cross-sections. That data is then used to direct an ultraviolet laser, whose beam solidifies the surface of a photosensitive liquid**. The partial object is then lowered beneath the liquid surface, and the process repeats using data from the next higher slice. Hundreds or thousands of layers later, the object is complete.

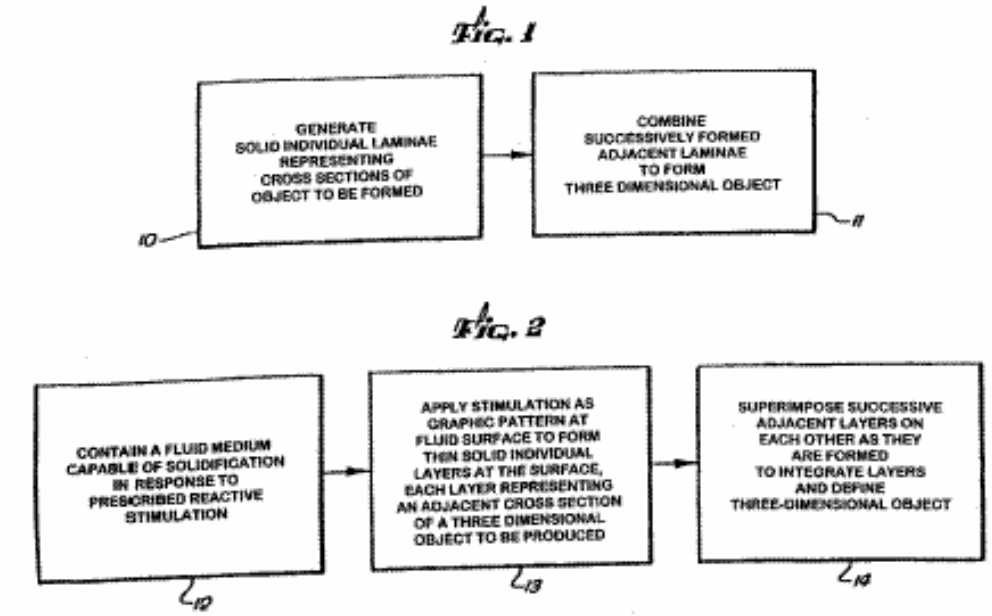
3D's Aaroflex Trial Brief at 1 (Exh. 6) (emphasis added). Moreover, the specification of the '981 Patent confirms that in *every embodiment*, the object to be formed is created by curing slices of the object that are uniformly thick (i.e., the thickness of an individual slice does not vary across the tank holding the curable material). The only way for this to occur (as will also be seen in the other paradigm patents discussed below) is by slicing a representation of the object into horizontal slices of constant thickness so that the data for each "slice" can be used to drive the moving source of radiation to cure the liquid.

The Summary of the Invention states that the claimed invention is limited to the formation of individual, uniformly thick layers of the object:

> Stereolithography" is a method and apparatus for making solid objects by successively "printing" thin layers of a curable material, e.g., a UV curable material, one on top of the other. A programmed movable spot beam of UV light shining on a surface or layer of UV curable liquid is used to form **a solid cross-section of the object at the surface of the liquid**. The object is then moved, in a programmed manner, away from the liquid surface by **the thickness of one layer**, and the next cross-section is then formed and adhered to the immediately preceding layer defining the object. This process is continued until the entire object is formed.

The '981 Patent at 2:45-55 (Exh. 2) (emphasis added). *See also*, *Id.* at 6:5-16.

As the foregoing excerpt indicates, the invention cures one cross-sectional layer at a time to build the object. As it also indicates, each layer is defined by one thickness, which therefore is constant. Figures 1 and 2 further indicate that the process involves sequentially curing, uniformly thick, individual slices ("laminae") of the object to be formed:

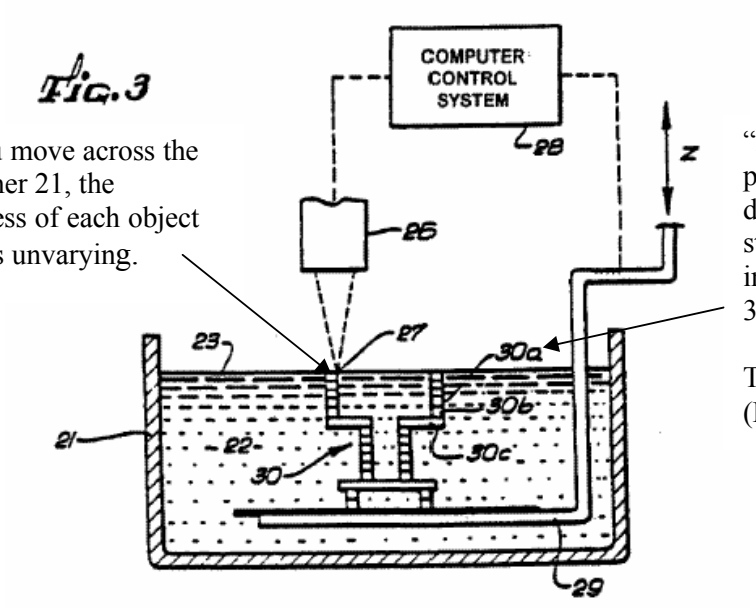


"Referring now to FIG. 1, the *stereolithographic method of the present invention* is broadly outlined. Step 10 in FIG. 1 calls for the generation of individual solid laminae representing cross-sections of a three-dimensional object to be formed." *Id.* at 5:6-9 (emphasis added). Figure 2 and its corresponding description set forth the process more particularly:

> The aforedescribed technique is more specifically outlined in the flowchart of FIG. 2, wherein Step 12 calls for containing a fluid medium capable of solidification in response to prescribed reactive stimulation. Step 13 calls for application of that stimulation as a graphic pattern at a designated fluid surface **to form thin, solid, individual layers at that surface, each layer representing an adjacent cross-section of a three-dimensional object to be produced**.
>
> * * *
>
> Hence, the ideal theoretical state would be an object produced only at the designated working surface of the fluid medium to provide an infinite number of laminae, **each lamina having a cured depth of approximately only slightly more than zero thickness**. Of course, in the practical application of the invention, each lamina will be a thin lamina, but thick enough to be adequately cohesive in forming the cross-section and adhering to the adjacent laminae defining other cross-sections of the object being formed.

Id. at 5:29-49. Again, the foregoing excerpt emphasizes that each layer (lamina) has **a** cured depth, indicating that it is of uniform thickness.

Other figures of the '981 Patent also confirm that each object layer is defined by a constant thickness section:



As you move across the container 21, the thickness of each object layer is unvarying.

"As the device operates, it produces a three-dimensional object 30 by step-wise buildup of integrated laminae such as 30a, 30b, 30c."

The '981 Patent at 6:36-38 (Exh. 2).

The file history of the '981 Patent similarly states that the claimed object data is sliced into sections of constant thickness. The '981 Patent claims priority to U.S. Patent Application No. 07/967,303 (the "'303 App.").[6] In a Preliminary Amendment filed with the '303 App., 3D described the meaning of the term "layer" as follows:

> For example, page 10, lines 8-30, describe that each successive layer represents an adjacent cross-section of a three-dimensional object and that **the layer thickness** of each cross-section is finite**. Successive cross-sectional layer data is associated with, for example, successive vertical layers of the three-**

[6] As mentioned previously, the file history of a parent or ancestor application is relevant to the construction of a disputed claim term. *Omega Engineering Inc., v. Raytek Corporation, et al.,* 334 F.3d 1314, 1333 (Fed. Cir. 2003).

> **dimensional object**, wherein each vertical level is spaced apart from its immediate neighbors by **one layer thickness**.

Preliminary Amendment, dated October 20, 1992 (Exh. 10) at 8 (emphasis added).

Claim 11 states that the formation of horizontal object slices is based on and driven by the data representation of the object being formed (i.e., "exposing said medium to said prescribed radiation ***in response to said data***"). Thus, the "data representing the three-dimensional object" is necessarily a sliced representation of the object being formed, as confirmed by the prosecution history and 3D's definition of "stereolithography" in the Aaroflex suit. The '981 Patent explains that the sliced object representation is translated into the commands that drive the layer-by-layer object formation process:

> The computer 28 in the stereolithographic system of the present invention has two basic functions. The first is to help the operator design the three-dimensional object in a way that it can be made. The second is to **translate the design into commands that are appropriate for the other stereolithographic components, and to deliver these commands in a way so that the object is formed**.

The '981 Patent at 8:25-31 (Exh. 2) (emphasis added). Other portions of the Summary of the Invention indicate that the sliced "data representation" is used to generate the commands that drive the layer-by-layer curing process:

> [T]he present invention harnesses the principles of computer generated graphics in combination with stereolithography, i.e., the application of lithographic techniques to the production of three dimensional objects, **to simultaneously execute computer aided design (CAD) and computer aided manufacturing (CAM) in producing three-dimensional objects directly from computer instructions**.
>
> * * *
>
> Essentially all types of object forms can be created with the technique of the present invention. Complex forms are more easily created by using **the functions of a computer to help generate the programmed commands and to then send the program signals to the stereolithographic object forming subsystem**.

Id. at 2:34-44 and 2:57-62 (emphasis added).

The foregoing statements concern the invention generally and are not limited to specific embodiments. Based on the specification, file history, and 3D's admissions from the Aaroflex case, the claimed "object representation" should be construed to be a horizontally-sliced representation, wherein each slice has a constant thickness. *See Honeywell International, Inc., et al., v. ITT Industries, Inc.*, 452 F.3d 1312, 1318-1319; *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001).

5. **"Forming a First Cross-Sectional Layer"**

This phrase should be construed to mean, "**forming a first horizontal object slice of constant thickness**." As indicated in Section III.A.4, above, the '981 Patent specification and file history make clear that the "cross-sectional layers" referred to in the claims are horizontal object slices of constant thickness. Both the Summary of the Invention and the Detailed Description make reference to *the thickness* of one layer, s*ee* the '981 Patent at 2:45-55 and 6:5-16 (Exh. 2), as does the file history. *See* Preliminary Amendment, dated October 20, 1992 (Exh. 10) at 8. Every one of the '981 Patent figures depicts layers that are unvarying in thickness across the curable liquid container. Further, nowhere does the specification make reference to varying the thickness of a layer at different locations in the container.

The Federal Circuit "has observed that dictionaries and treatises can be useful in claim construction." *Phillips*, 415 F.3d at 1318. Dictionary sources further confirm that a "layer" is limited to a single thickness. For example, the *Oxford English Dictionary* defines a "layer" as "**a** thickness of matter spread over a surface." *Oxford English Dictionary* (Vol. 1, 1961) at 133 (definition II.2) (Exh. 11) (emphasis added). Similarly, *Webster's New Encyclopedic Dictionary* defines "layer" as "**one** thickness, course, or fold laid or lying over or under another." *Webster's*

New Encyclopedic Dictionary (1993) at 568 (Exh. 12) (emphasis added). *Webster's New World Dictionary* defines layer as a "**single** thickness, oat, fold, or stratum." *Webster's New World Dictionary* (3rd ed. 1988) at 766 (Exh. 13) (emphasis added).

The foregoing portions of the '981 Patent specification and figures indicate that the term "cross-section" refers to a horizontal, planar slice of the object. *See* FIG. 3. Dictionary sources confirm the meaning of "cross-section," which is variously defined as "a section made by a plane cutting anything transversely," (*Oxford English Dictionary* (Exh. 11) at 1196 (def. V.B.); "a section cut off at right angles to an axis by a plane," (*Webster's New Encyclopedic* Dictionary (Exh. 12) at 240), and "cutting through something, esp. at right angles to its axis." *Webster's New World Dictionary* (Exh. 13) at 331. In the context of objects being built in the vertical direction (or "z-direction"), these definitions clearly indicate that the referenced "cross-sections" in claim 11 of the '981 Patent are defined by horizontal, planar slices.

3D's proffered construction of "forming a first cross-sectional layer" is "forming an initial thickness of solidified building material representing a cross-section of the object." This construction is flawed for several reasons. First, it is tautological as to the term "cross-section." Second, it is not in accord with the intrinsic and extrinsic evidence, both of which clearly indicate that the term "layer" requires an unvarying thickness. "[T]he specification acts as a dictionary when it . . . defines [claim] terms by implication." *Phillips,* 415 F.3d at 1321 (citations omitted). There is no suggestion in the '981 Patent that "cross-sectional layer" could have an ordinary meaning broader than a horizontal object slice of constant thickness. The '981 Patent consistently indicates that a "cross-sectional layer," is a uniformly thick, horizontal section, and 3D "is not entitled to a claim construction divorced from the context of the written

description . . . ." *Old Town Canoe Co. v. Confluence Holdings Corp.*, 448 F.3d 1309, 1318 (Fed. Cir. 2006).

6. **"Exposing Said Medium to Said Prescribed Radiation"**

This phrase should be construed to mean "**moving a beam of radiation across the selected locations on the surface of the curable liquid to draw a radiation pattern thereon**." As explained in Sections III.A.1 and III.A.2, above, both in the specification of the '981 Patent and in the file history of its parent application (the '979 App.), 3D clearly indicated that the claims of the '981 Patent are limited to the use of beams of radiation which draw a radiation pattern as they move across the surface of a curable liquid. Thus, "exposing said medium to said prescribed radiation" must be limited accordingly. 3D's proffered construction is "exposing said medium to the 'prescribed radiation,'" wherein the "prescribed radiation" is defined as "predetermined (1) electromagnetic radiation . . . or (2) particle beams . . . ." However, 3D's construction circularly uses the word "exposing." As 3D admitted in *Aaroflex* and as confirmed by the '981 Patent specification, the claimed "exposing" is limited to processes that draw a radiation pattern, and the claimed "prescribed radiation" is limited to beams of radiation that move across the surface of a curable liquid.

7. **"Forming Successive Layers of Medium**"

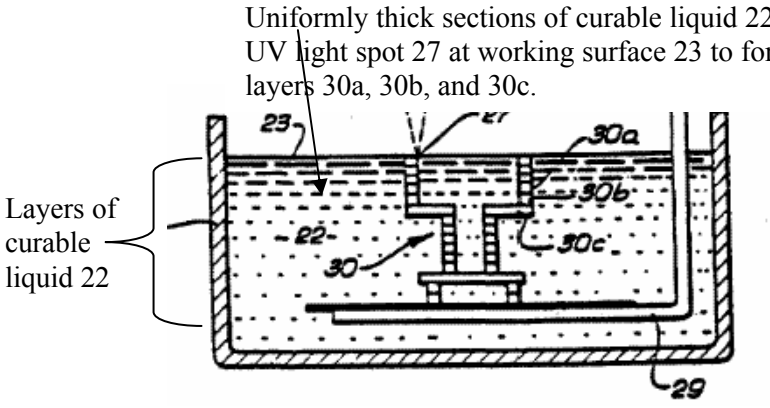
As discussed in Sections III.A.4 and 5, above, the intrinsic evidence and dictionary sources are in agreement that a "layer" has a constant thickness. Thus, the appropriate construction of this phrase is "**forming additional, curable liquid sections of constant thickness**." The '981 Patent specification consistently describes the claimed stereolithographic process by referring to uniformly thick layers of the three-dimensional object. These layers are

formed by solidifying uniformly thick layers of the curable liquid (i.e., the medium), as discussed in the Summary of the Invention:

> In this regard, as the fluid medium cures and solid material forms as a thin lamina at the working surface, a suitable platform to which the first lamina is secured is moved away from the working surface in a programmed manner by any appropriate actuator, typically all under the control of a micro-computer or the like. In this way, the solid material that was initially formed at the working surface is moved away from that surface and **new liquid flows into the working surface position. A portion of this new liquid is, in turn, converted to solid material by the programmed UV light spot to define a new lamina**, and this new lamina adhesively connects to the material adjacent to it, i.e., the immediately preceding lamina.

The '981 Patent at 3:16-27 (Exh. 2) (emphasis added). More specifically, the Summary of the Invention explains that once a layer is solidified, "[t]he object is then moved, in a programmed manner, away from the liquid surface by ***the thickness of one layer***, and the next cross-section is then formed . . . ." *Id.* at 2:51-53 (emphasis added). Thus, the liquid that flows into the space between the upper surface of the previously solidified layer and the exposed surface of the curable liquid has *one* thickness.

The figures of the '981 Patent are in accord, as shown in the following portion of FIG. 3:



3D's construction of "forming successive layers of medium" is "forming additional thicknesses of the building material." However, 3D's construction fails to reflect the ordinary meaning of the term "layer" as evidenced by the specification and the dictionary definitions discussed in Sections III.A. 4 and 5, above.

8. **"Previously Formed Cross-Sectional Layers"**

This phrase should be construed to mean "**previously solidified, horizontally-sliced object sections of constant thickness**" for the reasons provided above in Sections III.A. 4 and 5, above. 3D's construction of this phrase—"thicknesses of the building material that have already been solidified" fails to account for the ordinary meaning of "cross-sectional layers" and should be rejected.

9. **"Forming and Adhering Successive Cross-Sectional Layers"**

This phrase should be construed to mean "**forming and adhesively attaching additional horizontally-sliced object sections of constant thickness**." For the reasons provided above in Sections III.A. 4 and 5, the phrase "cross-sectional layers" refers to horizontally-sliced object sections of constant thickness. The '981 Patent does not provide a definition of "adhering." However, it states that the "UV curable liquid must . . . be *adhesive* so that successive layers will adhere to one another." The '981 Patent at 6:60-64 (Exh. 2) (emphasis added). 3D's construction—"forming and integrating additional thicknesses of solidified building material"—is flawed, at least because it fails to account for the ordinary meaning of "cross-sectional layers" as discussed previously.

3D's definition of "adhering" is apparently "integrating." In support of its definition, 3D cites several portions of the '981 Patent specification which refer to the "integration" of successive layers (e.g., "Superposition of successive adjacent layers on each other is automatically accomplished, as they are formed, to integrate the layers and define the desired three-dimensional object," the '981 Patent at 3:14-16, Exh. 2). However, the discussion of "integrating" layers sheds no light on the meaning of "adhering." It simply refers to the fact that the individual layers cooperatively define a complete object. The meaning of "adhering" goes to *how* the layers cooperate to form an integral object. As the relevant portions of the specification indicate, the layers *must* adhesively attach to one another to form an integral object. Thus, the correct meaning of "adhering" is "adhesively attaching." *See Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *11-12 (Fed. Cir. 2007) (holding that features described as critical in the specification limit claim scope).

10. **"Exposing Said Medium to Said Prescribed Radiation in Response to Said Data"**

This phrase should be construed to mean "**moving the beam of radiation across the selected locations on the surface of the curable liquid to draw a radiation pattern thereon based on the horizontally-sliced object sections of constant thickness**." As explained in Section III.A.6, above, the proper construction of "exposing said medium to said prescribed radiation" is "**moving a beam of radiation across the selected locations on the surface of the curable liquid to draw a radiation pattern thereon**." The phrase "said data" refers back to the earlier phrase "data representing the three-dimensional object to be formed." As discussed in Section III.A.4, above, "said data" refers to *sliced* data comprising horizontal object slices of constant thickness.

3D's construction of this phrase is "subjecting the building material to the predetermined (1) electromagnetic radiation . . . . or (2) particle beams . . . . ." However, as discussed previously, 3D fails to account for the proper meaning of the term "exposing" in light of the numerous specification statements that limit it to processes that "draw" a radiation pattern across the surface of a curable liquid. 3D also ignores the fact that the '981 Patent specification clearly limits the *claimed* "prescribed radiation" to radiation beams that move across the surface of the curable liquid. 3D further ignores the fact that the phrase "said data" refers to sliced data, notwithstanding its admission in *Aaroflex* that "stereolithography" is defined by the use of *sliced data* to drive the movement of a radiation beam. 3D's Aaroflex Trial Brief at 1 (Exh. 6). Thus, 3D's construction should be rejected.

11. **"Plurality of Adhered Cross-Sectional Layers"**

This phrase should be construed to mean "**several adhesively attached, horizontally-sliced object sections of constant thickness**" for the reasons provided in Section III.A.9, above. 3D's construction—"two or more thicknesses of solidified building material that have been integrated"—fails to account for the ordinary meaning of "cross-sectional layers"—which means horizontally-sliced object sections of constant thickness. 3D's construction also lacks the proper meaning of "adhered," which means "adhesively attached."

12. **"Prescribed Radiation"**

This phrase should be construed to mean "**a beam of radiation configured to move across the surface of a curable liquid and draw a radiation pattern thereon**," as discussed in Section III.A.3, above.

B. The '934 Patent (Claim 2)

The asserted paradigm claim from the '934 Patent is claim 2.[7] Defendants' constructions of the disputed limitations of claim 2 are set forth below.

1. "**Stereolithographically Forming a Portion of a Three-Dimensional Object**"

This phrase should be construed to mean "**moving a beam of radiation across the surface of a curable liquid to create part of a solid object by drawing a radiation pattern thereon**." First, 3D does not dispute that the preamble limits the scope of the claim to stereolithographic processes. Nor could it legitimately do so. As with the '981 Patent, the '934 Patent is replete with statements indicating that the claimed invention is limited to stereolithography. For example, the Background of the Invention states that "This invention relates generally to an improved *stereolithography* apparatus and method . . . . ." The '934 Patent at 1:17-18 (Exh. 3) (emphasis added). Similarly, the Background of the Invention repeatedly refers to stereolithography in describing the problems the invention is intended to address, e.g. "Previous stereolithography doctor blades provide means to reduce the cycle time"; "Measuring and controlling the level of the working fluid in a stereolithographic apparatus is also desirable with layer formation using a blade"; and "stereolithographic machines require very precise control of the level of the working fluid." *Id.* at 3:40-41, 4:23-25, and 4:49-50. The Detailed Description of *the Invention* similarly states that "FIGS. 1 and 2 schematically illustrate a stereolithography system." *Id.* at 7:60-61.

[7] Claim 2 is a dependent claim based on claim 1.

As discussed previously, in its lawsuit against Aaroflex, 3D admitted that stereolithography is defined by the use of radiation beams that draw a radiation pattern as they move across the surface of a curable liquid (e.g., an ultraviolet laser beam):

> A stereolithography system creates three-dimensional objects, layer by layer. The process takes place under the control of a computer, which receives data describing the three-dimensional object to be built and "slices" it to produce data describing cross-sections. That data is then used to **direct an ultraviolet laser, whose beam solidifies the surface** of a photosensitive liquid.[8]

The '934 Patent similarly establishes that stereolithography processes are limited to the use of moving radiation beams to draw a radiation pattern across the surface of a curable liquid. The Background of the Invention describes the claimed stereolithography process as follows:

> An ultraviolet laser generates a small intense spot of UV which is moved across the liquid surface with a galvanometer mirror X-Y scanner in a predetermined pattern. The scanner is driven by computer generated vectors or the like.

The '934 Patent at 1:50-55 (Exh. 3).

The Background of the Invention also states that a "typical stereolithography system for use with photopolymers includes **a laser scanner**, a vat or tank for containing the polymerizable liquid, and an object support platform, which is capable of being raised and lowered in the tank, and a controlling computer." *Id.* at 1:58-62 (Exh. 3) (emphasis added).

As indicated in 3D's claim chart, the '934 Patent incorporates by reference several other patents to provide "further details of stereolithography." *Id.* at 2:20-3:39 (Exh. 3). "Incorporation by reference provides a method for integrating material from various documents into a host document . . . by citing such material in a manner that makes clear that the material is effectively part of the host document as if it were explicitly contained therein." *Cook Biotech,*

[8] 3D's Aaroflex Trial Brief at 1 (Exh. 6).

Inc. v. Acell, Inc., 460 F.3d 1365, 1376 (Fed. Cir. 2006). In *Cook*, the Court relied on an incorporated patent's disclosure to construe a disputed claim term in the incorporating patent. *Id.* at 1377-78. One of the '934 Patent's incorporated patents (which is cited in 3D's claim chart) is U.S. Patent No. 4,575,330 (the "'330 Patent"). In support of its claim construction, 3D selectively excerpts from the '330 Patent, ignoring those portions of the patent that clearly describe the scope of stereolithography. Like the '981 Patent, the '330 Patent includes the following general description of the features that are common to all stereolithography processes:

> It will be apparent from the foregoing that, while a variety of stereolithographic systems have been disclosed for the practice of the present invention, **they all have in common the concept of drawing upon a substantially two-dimensional surface** and extracting a three-dimensional object from that surface.

The '330 Patent at 11:55-60 (Exh. 14) (emphasis added). The '330 Patent specification is replete with other statements indicating that stereolithography is limited to the use of radiation beams that move across the surface of a curable liquid to draw a radiation pattern. For example, the Summary of the Invention describes stereolithography as follows:

> Stereolithography" is a method and apparatus for making solid objects by successively "printing" thin layers of a curable material, e.g., a UV curable material, one on top of the other. **A programmed movable spot beam of UV light shining on a surface or layer of UV curable liquid is used to form a solid cross-section of the object at the surface of the liquid**. The object is then moved, in a programmed manner, away from the liquid surface by the thickness of one layer, and the next cross-section is then formed and adhered to the immediately preceding layer defining the object. This process is continued until the entire object is formed.

Id. at 2:37-48. Elsewhere in the Summary of the Invention, the '330 Patent refers to the fact that the moving radiation beam is "applied as a graphic pattern." *Id.* at 3:1-7.

The '934 Patent also incorporates by reference U.S. Patent No. 5,104,592 (the "'592 Patent"). The '934 Patent at 2:20-30 (Exh. 3). Like the '330 Patent, the '592 Patent describes all

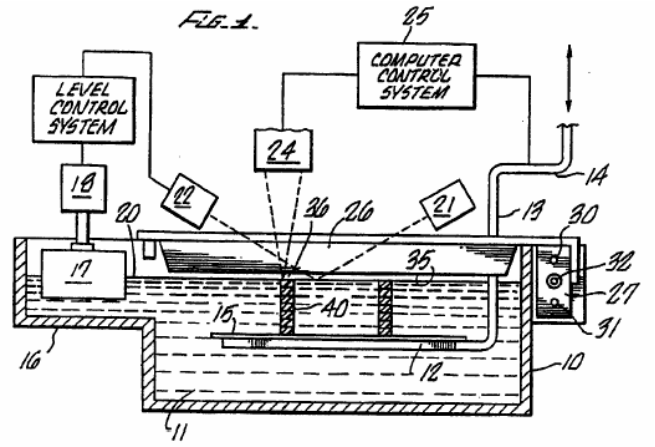
stereolithography processes as having "in common the concept of drawing upon a substantially two-dimensional surface and extracting a three-dimensional object from that surface." The '592 Patent at 20:9-14 (Exh. 15). The '592 Patent also states that "Stereolithography is a three-dimensional printing process which uses a moving laser beam to build parts by solidifying successive layers of liquid plastic." The '592 Patent at 5:12-14 (Exh. 15). As 3D said, "[w]hen a specification describes a particular feature as always present in the invention, the corresponding limitation *must be interpreted as limited* to the disclosed feature."[9] Because the '934 Patent specification expressly limits the scope of stereolithography to those processes that move a radiation beam across the surface of a curable liquid to draw a radiation pattern, its claims must be construed accordingly. *Honeywell International, Inc., et al., v. ITT Industries Corp.,* 452 F.3d 1312, 1318 (Fed. Cir. 2006); *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001).

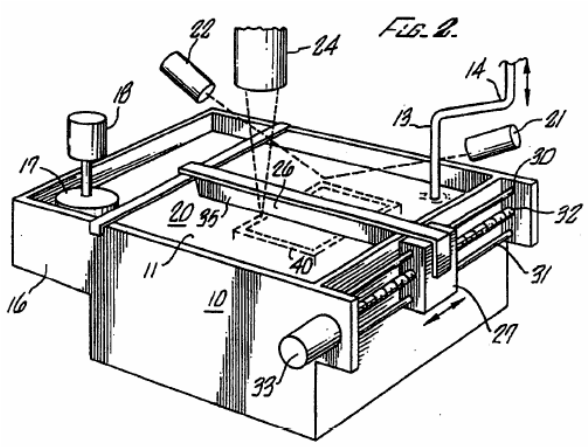
3D's construction of "stereolithographically forming a portion of a three-dimensional object" is "successively curing a plurality of layers of a curable medium to form a portion of a product, prototype, or model which has three dimensions." 3D's litigation-inspired construction fails to account for the numerous specification statements that define stereolithography by its use of a radiation beam that moves across the surface of a curable liquid to draw a radiation pattern. Accordingly, it should be rejected.

There are no embodiments expressly described in the '934 Patent *other* than those in which a radiation beam traverses the surface of the curable liquid. For example, FIGS. 1 and 2

[9] 3D's Aaroflex Jury Instructions at 3-4 (Exh. 8) (emphasis added).

of the '934 Patent "illustrate a stereolithography system." The '934 Patent at 7:60-61 (Exh. 3). "A computer controlled radiation source is disposed above the bath 11 to direct curing media, such as ultraviolet radiation or other types of curing stimulation, in a predetermined pattern across the upper surface 20 . . . ." *Id.* at 8:16-20. Figures 1 and 2 are reproduced below:





Nevertheless, 3D may argue that the claims of the '934 Patent encompass stationary radiation sources because the '934 Patent incorporates the '330 Patent by reference. Figure 5 of the '330 Patent uses a stationary radiation source in connection with a "mask exposure" system. Specifically, Figure 5 of the '330 Patent discloses the same "mask exposure" system that is shown in Figure 5 of the '981 Patent and which was discussed in Section III.A.1, above. For the same reasons provided therein, a construction that encompasses Figure 5 of the '330 Patent would be improper. First, it would be inconsistent with 3D's repeated statements in the '934 Patent specification that "the invention" is limited to stereolithography. *Scimed Life Sys. v. Advanced Cardiovascular Sys.,* 242 F.3d 1337, 1341 (Fed. Cir. 1991).

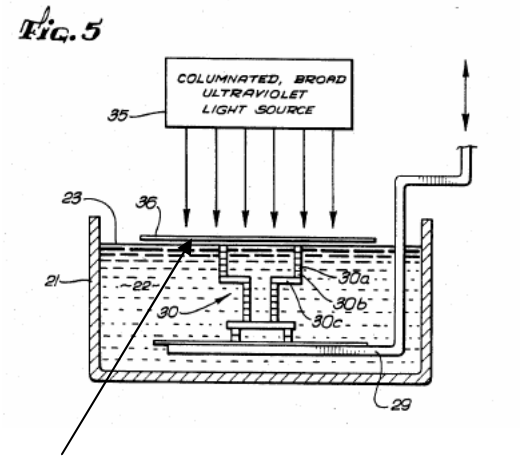
Second, there is no "mask exposure" or stationary radiation source system in the '934 Patent (or the patents it incorporates by reference) that embodies claim 2. Claim 2 recites a "smoothing element." Nowhere in the '934 Patent, '330 Patent, or '592 Patent is there any

reference to a mask exposure or other stationary radiation source system with a smoothing element. Defendants' construction does *not* "read out" or exclude any of 3D's embodiments of claim 2.

Third, a construction that encompasses the masked exposure system of Figure 5 would be non-enabled, and therefore, improper. *See Wang Laboratories, Inc. v. America Online, Inc.*, 197 F.3d 1377, 1383 (Fed. Cir. 1999). Like the '981 Patent, the '330 Patent contains the following description of a mask exposure system:

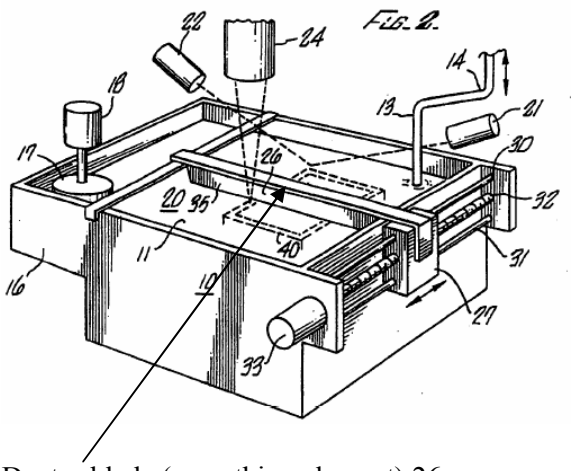
> The system of FIG. 5 is similar to that of FIG. 3, but the movable UV light source 26 is eliminated and a collimated, broad UV light source 35 and suitable apertured mask 36 is substituted for the programmed source 26 and focused spot 27. The apertured mask 36 is placed as close as possible to the working surface 23, and collimated light from the UV source 35 passes through the mask 36 to expose the working surface 23, thereby creating successive adjacent laminae, as in the embodiments of FIGS. 3 and 4. However, the use of a fixed mask 36 provides three-dimensional objects with a constant cross-sectional shape. **Whenever that cross-sectional shape is to be changed, a new mask 36 for that particular cross-sectional shape must be substituted and properly aligned. Of course, the masks can be automatically changed by providing a web of masks (not shown) which are successively moved into alignment with the surface 23**.

The '330 Patent at 10:6-23 (Exh. 14) (emphasis added). As the foregoing excerpt indicates, the system of FIG. 5 requires some means for automatically changing web masks. No such system is described anywhere in the patent. As mentioned above, claim 2 of the '934 Patent recites the use of a "smoothing element" having a "plurality of substantially separate members." Nowhere does the '934 Patent indicate how the claimed smoothing element could or would function with a mask exposure system. To the contrary, Figure 5 of the '330 Patent suggests that a smoothing element would not function in such a system because the masks are positioned at the specific location where the "smoothing element" of the '934 Patent contacts the curable liquid:



Mask 36

FIG. 5 of the '330 Patent.



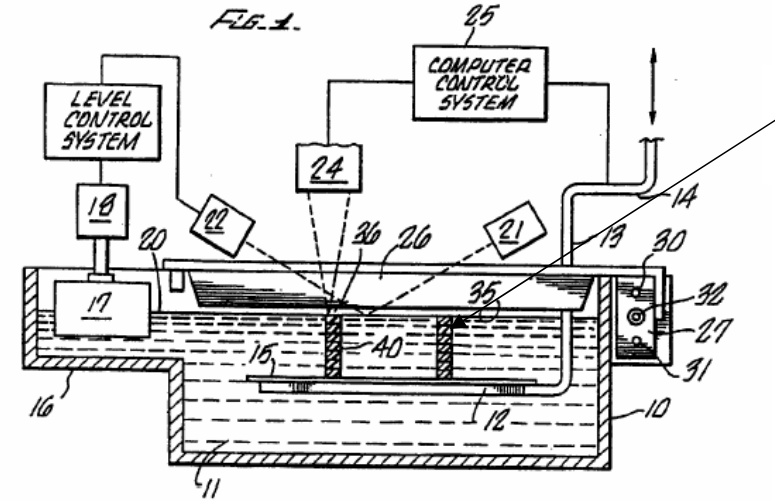
Doctor blade (smoothing element) 26

FIG. 2 of the '934 Patent

The '934 Patent does not teach one of ordinary skill in the art how a system of masks could be generated and manipulated to allow the doctor blade 26 to smooth the surface of the curable liquid. Thus, a construction of claim 2 that encompasses Figure 5 of the '330 Patent would be non-enabled and improper because claims are best construed to preserve their validity. *See Medtronic Navigation, Inc., et al., v. Brainlab Medzinische Computersysteme GmbH, et al.,* 2007 U.S. App. LEXIS 2521 at *8-*10 (Fed. Cir. 2007) (non-precedential) (affirming claim construction that excludes a non-enabled embodiment); *Wang Laboratories, Inc. v. America Online, Inc., et al.,* 197 F.3d 1377, 1383 (Fed. Cir. 1999).

2. "**Subsequent Layer**"

This phrase should be construed to mean "**a new section of constant thickness**." The specification of the '934 Patent consistently refers to a "layer" as a section of constant thickness. For example, each layer depicted in Figure 1 is defined by a single thickness that does not vary across the width of tank 10:



In addition, the '934 Patent refers to the layers of the object as single thickness sections. For example, in describing Figures 1 and 2 the specification refers to "***the*** desired thickness of the layer of polymerizable liquid to be cured." The '934 Patent at 8:40-42 (Exh. 3) (emphasis added). While there may be a thickness variation between different layers, the specification makes clear that each individual layer has a specific, constant thickness:

> A series of transformed layers are built up in the aforesaid manner, as shown in FIG. 1, with each layer being in effect a thin cross-section of the desired three-dimensional object 40. **The thickness** of the individual layers can vary depending upon the geometry of the part being formed, the composition and viscosity of the untransformed building material and the nature and intensity of the curing stimulation media. However, typical thicknesses range from about 0.003 to about 0.02 inch.

Id. at 9:31-39 (emphasis added). The specification also describes a specific example of the invention in which "**The** thickness of each layer applied was approximately 0.02 inch." *Id*. at 10:3-4 (emphasis added). In describing the recoating of new layers with a doctor blade, the specification also states that "the blade clearance will be, but may not be, the same as **the** layer thickness of the next layer to be formed." *Id.* at 13:58-59 (emphasis added). *See also Id.* at 16: 2-3 (emphasis added) (referring to "**the** desired layer thickness" of the next layer); *Id.* at 16:8

(emphasis added) (referring to "**a** typical layer thickness"); *Id.* at 16:24-25 (emphasis added) (referring to "Overdipping by more than **a** layer thickness").

As discussed in Section III.A.5, above, dictionary definitions also confirm that "layer" refers to a single thickness that does not vary across the width of the resin tank. *Oxford English Dictionary* (Exh. 11) at 133 (def. II.2.) ("a thickness of matter spread over a surface"); *Webster's New Encyclopedic Dictionary* (Exh. 12) at 568 ("one thickness, course, or fold laid or lying over or under another"); *Webster's New World Dictionary* (Exh. 13) at 766 ("a single thickness, coat, fold, or stratum").

3D's construction of "subsequent layer" is "a new thickness of building material." 3D's construction fails to properly reflect the ordinary meaning of "layer" as confirmed by both the specification and dictionary sources. In addition, the phrase "subsequent layer" is part of the larger phrase "wherein a subsequent layer of the *three-dimensional object*." As the context of the claim indicates, the "subsequent layer" is a layer of the *object* not the *building material*, as 3D's construction suggests.

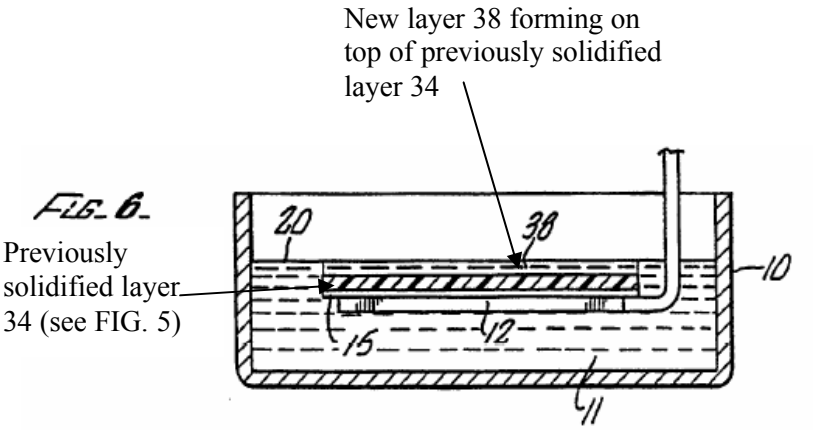
3. "**Formed Over**"

This phrase should be construed to mean "**solidified on top of**." The specification of the '934 Patent establishes that "over" is used in its normal sense to mean "on top of." The Background of the Invention of the '934 Patent describes the stereolithography process as follows:

> Basically, stereolithography is a method for automatically building complex three-dimensional parts (e.g., plastic parts) by **successively curing** a plurality of **thin layers** of a curable medium (e.g., polymerizable liquid) **on top of each other** until all of the thin layers are joined together to form a whole part.

The '934 Patent at 1:28-33 (Exh. 3).

Figure 6 and its corresponding description also describe the formation of layers on top of previously formed layers:



"After irradiation of layer 34, the object support platform 12 is further lowered as shown in FIG. 6 so that the liquid from the bath 11 flows over the previously cured layer 34 to form a new layer 38 to thereby initiate another cycle of the process." *Id.* at 9:26-30 (Exh. 3).

"[T]he specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication." *Phillips v. AWH Corp., et al.,* 415 F.3d 1303, 1321 (Fed. Cir. 2005) (citations omitted). In this case, the '934 Patent specification makes clear that "formed over" refers to the solidification of layers of the object on top of a previously solidified layer. 3D has not proffered a construction of the phrase "formed over."

4. "**Previously Formed Layer**"

This phrase should be construed to mean "**previously solidified, object section of constant thickness**." As mentioned in Section III.B. 2, above, both the specification of the '934 Patent and dictionary sources confirm that the ordinary meaning of "layer" is a section of constant thickness. 3D's construction--a previously cured thickness of building material--effectively writes out the defining feature of a layer: constant thickness.

5. "**Exposure to Prescribed Synergistic Stimulation**"

This phrase should be construed to mean "**having a pattern of radiation drawn at selected locations on the surface thereof with a beam of radiation that moves across the surface of a curable liquid**." As discussed in Section III.B.1, above, the '934 Patent specification is replete with statements indicating that the claimed invention is stereolithography and that stereolithography is defined by the use of radiation beams that move across the surface of a curable liquid to draw a radiation pattern. As discussed earlier, in *Aaroflex* 3D specifically admitted that stereolithography is so limited. 3D's Aaroflex Trial Brief at 1 (Exh. 6).

3D's construction of "exposure to prescribed synergistic stimulation" is "being subjected to predetermined (1) electromagnetic radiation . . . .; or (2) particle beams; or (3) reactive chemicals . . . ." 3D's construction is flawed for several reasons. First, it effectively defines "exposure" as "being subjected." However, *none* of the specification excerpts cited by 3D supports this construction. Second, 3D's construction ignores its admissions from the *Aaroflex* case and the numerous statements throughout the '934 Patent specification which confirm that "exposure to prescribed synergistic stimulation" refers to a process of drawing a radiation pattern by moving a beam of radiation across the surface of a curable liquid. Third, 3D ignores the fact that the only disclosed embodiments of claim 2 use a moving radiation beam to draw a radiation pattern on a curable liquid. *See* FIGS. 1-6 of the '934 Patent (Exh. 3).

"[W]here the specification makes clear that the invention does not include a particular feature, that feature is deemed to be outside the reach of the claims of the patent, even though the language of the claims, read without reference to the specification, might be broad enough to encompass the feature in question." *Honeywell International, Inc. v. ITT Industries, Inc.*, 452

F.3d 1312, 1319 (Fed. Cir. 2006). Here, 3D has made clear that "exposure to prescribed synergistic stimulation" refers to a process of drawing a radiation pattern on the surface of a curable liquid by moving a beam of radiation across it. Thus, 3D's after-the-fact attempts to broaden the scope of the phrase should be rejected.

6. "**Forming a Uniform Coating of Desired Layer Thickness Over the Previously Formed Layer**"

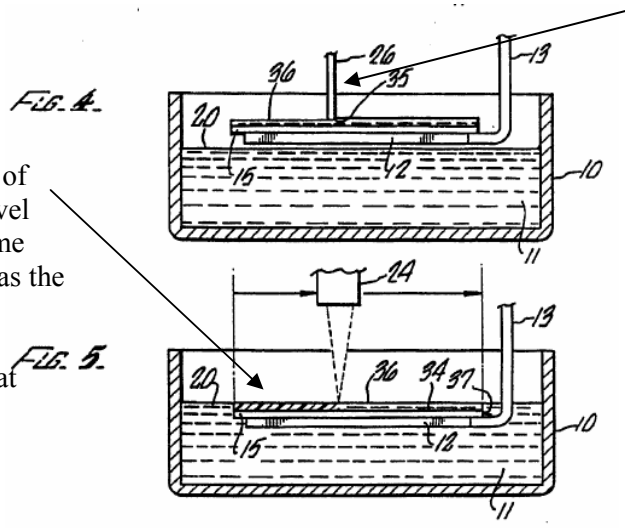
This phrase should be construed to mean "**creating a level, liquid section of constant selected thickness on top of a previously solidified object section of constant thickness by overdipping the object platform by more than the selected constant thickness of the next object section and then raising the platform to a point that is below the surface of the liquid by a distance equal to the selected constant liquid thickness.**" There are four key issues that inform the construction of this phrase: 1) "layer" refers to a constant thickness, 2) "uniform" refers to a level (flat) coating, 3) "over" refers to on top of, and 4) the claimed "forming" process is properly limited to the use of "deep dipping."

First, the claim makes clear that it refers to the formation of a layer of curable liquid on top of a previously solidified layer. Accordingly, the construction of this phrase must reflect the ordinary meaning of "layer" as discussed in Section III.B.2, above. As also explained in section III.B.3, above, the ordinary meaning of "over" is on top of, which is also reflected in Defendants' construction.

Second, the '934 Patent confirms that "uniform coating" refers to the formation of a layer having a *level liquid surface*. The specification repeatedly emphasizes the need to accurately control the level, stating that "stereolithographic machines require very precise control of the

level of the working fluid." The '934 Patent at 4:49-50 (Exh. 3). "[T]he level of the working fluid in the preferred embodiment must be maintained at a constant level so the beam of U.V. light will remain sharply in focus on a fixed plane." *Id.* at 4:56-59. "Measuring and controlling the level of the working fluid in a stereolithographic apparatus is also desirable with layer formation using a blade." *Id.* at 4:23-25.

The '934 Patent's embodiments also indicate that a "uniform coating" refers to a *level* (i.e., horizontally flat) liquid section of constant thickness. For example, FIGS. 4 and 5 depict a portion of a method for creating a uniform coating:



"[T]he smoothed upper surface 36 of the layer 34 is level with or in the same horizontal plane as the surface 20."

The '934 Patent at 9:3-5 (Exh. 3).

"Doctor blade 26 . . . strikes off excess polymerizable liquid from the layer 34 and thereby smooths [sic] the upper surface (36) of the coating of material over surface 15."

The '934 Patent at 8:58-62 (Exh. 3).

Dictionary definitions also confirm that for the coating to be "uniform" its level must be unvarying. *See Oxford English Dictionary* (Exh. 11) at 224 (def. 3) ("Of motion, dimensions, etc.: Free from fluctuation in respect of quantity or amount"); *Webster's New Encyclopedic Dictionary* (Exh. 12) at 1137 ("having always the same form, manner, or degree: not varying or variable"); *Webster's New World Dictionary* (Exh. 13) at 1458 ("always the same; not varying or changing in form, rate, degree, manner, etc.: constant").

Third, the '934 Patent establishes that the process of *forming* a uniform coating is limited to use of "deep dipping" because it is a critical part of the recoating process. The Background of the Invention describes the deep dipping process as follows:

> Typically, the cured layer, which is supported on a vertically movable object support platform, is **dipped below the surface** of a bath of the viscous polymerizable liquid **a distance greater than the desired layer thickness** so that liquid flows over the previous cross-section rapidly. Then, **the part is raised to a position below the surface of the liquid equal to the desired layer thickness**, which forms a bulge of excess material over at least a substantial portion of the previous cross-section. When the surface levels (smooths out), the layer is ready for curing by radiation.

The '934 Patent at 2:10-19 (Exhibit 3) (emphasis added).

The '934 Patent also describes a typical recoating process as follows:

> A typical recoating cycle comprises the following steps: 1) **deep over-dipping** of the part; 2) detecting and adjusting resin surface level; 3) raising the part to the appropriate level so that it is located at the first blade clearance beneath the blade, a/k/a "up dipping"; 4) sweeping; 5) positioning the part for additional sweeps and performing these sweeps; 6) **moving the part to its proper position, one layer thickness below the working surface**, if necessary; and 7) delaying so that any intolerable surface imperfections settle out.

Id. at 16:11-19 (emphasis added).

According to the '934 Patent, deep dipping is *necessary* in order to ensure the formation of a uniform coating. For example, the specification states that "[o]verdipping by more than a layer thickness . . . ensures that excess resin will form over at least a substantial portion of the part." *Id*. at 16:24-26. It also states that overdipping "ensures that surface disruptions . . . level out faster" and that "If the part were immersed close to the surface, any surface disruption which could form above the part would take longer to level out." *Id.* at 16:29-31. In addition, "if overdipping were limited to one layer thickness, then thin layer thicknesses of 0.1 to 0.5mm

(approximately 4 mils to 20 mils) would be very difficult to recoat," even though such layers "may be necessary to build many parts with high resolution." *Id.* at 16:37-41.

Because the '934 Patent describes the use of "deep dipping" as critical to the process of "forming a uniform coating," that phrase must be limited accordingly. The Federal Circuit recently addressed a similar issue in *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 (Fed. Cir. 2007). In *Andersen*, the claim at issue recited a "composite composition." The District Court construed "composite composition" to mean "a solid pellet or a solid linear extrudate, which may subsequently be remelted and extruded to make a structural member." *Id*. at *6. The Federal Circuit affirmed the District Court's claim construction, holding that "[w]hile nothing on the face of the asserted claims states that the term 'composite composition' is limited to a mixture that is in pellet or linear extrudate form, the specification makes clear that the term, as used in the [ ] patents, must be construed to be limited in that matter." *Id*. In arriving at its holding, the Federal Circuit relied on portions of the specification that described "the formation of linear extrudates or pellets . . . as a critical element in the process . . . ." *Id*. at *11. In particular, the specification described the use of linear extrudates or pellets as required for "successful manufacture of structural members." *Id.* at *11-12. The Court also noted that such statements were "characterizations directed to the invention as a whole," not to particular embodiments. *Id*. at *12.

As in *Andersen*, the '934 Patent describes deep dipping as a critical element for forming a uniform coating, and it does so in a way that applies to the invention generally, not to a particular embodiment. Accordingly, the Court should limit "forming a uniform coating" to the use of deep dipping processes.

3D's construction of "forming a uniform coating" is "applying a substantially consistent layer of uncured building material." 3D's construction is flawed for several reasons. First, 3D improperly attempts to rewrite the meaning of "uniform" to mean *substantially* uniform. Nothing in the '934 Patent specification or in the language of claim 2 supports broadening the term as 3D suggests. Second, 3D's construction is vague as to the meaning of "substantially consistent" in that it does not identify *what* about the coating is substantially consistent. As discussed above, the '934 Patent clearly indicates that the coating *level* must be consistent in order for the coating to be considered "uniform." Third, like 3D's earlier constructions, its construction of "forming a uniform coating . . . " fails to account for the ordinary meaning of the term "layer," which refers to a constant thickness. Finally, 3D's construction ignores the fact that the specification refers to deep dipping as being critical to ensuring that a uniform coating actually is formed. Thus, 3D's construction seeks to impermissibly broaden the scope of the claims. 3D "is not entitled to a claim construction divorced from the context of the written description." *Old Town Canoe Co.*, v. *Confluence Holdings Corp.*, 448 F.3d 1309, 1318 (Fed. Cir. 2006). The context of the '934 Patent indicates that "forming a uniform coating" requires the use of deep dipping.

7. "**Sweeping a Smoothing Element**"[10]

This phrase should be interpreted to mean "**sweeping away excess curable liquid by moving a device having the structure of Figures 26 or 27 of the '934 Patent, or structural**

[10] Based on the constructions of "formed over" and "previously formed layer," Defendants' construction of "**over a previously formed layer**" is "**on top of the previously solidified object section of constant thickness**."

equivalents thereof, across the surface of the curable liquid to create a level surface." The term "smoothing element" is properly construed in accordance with the rules for "means-plus-function" elements under 35 U.S.C. § 112, ¶ 6. Means-plus-function claim elements are "construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. ¶ 6. While claim terms lacking the word "means" are presumptively *not* subject to Section 112, paragraph 6 treatment, "a limitation lacking the term 'means' may overcome the presumption against means-plus-function treatment if it is shown that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function." *The Massachusetts Institute of Technology, et al., v. Abacus Software, et al.,* 462 F.3d 1344, 1353 (Fed. Cir. 2006) (citations omitted). "The generic terms 'mechanism,' 'means,' 'element,' and 'device' typically do not connote sufficient structure." *Id*. at 1354 (emphasis added).

In *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206 (Fed. Cir. 1998), the Federal Circuit held that it was proper to "limit the [claim term] 'lever moving element' to structures disclosed in the specification and equivalents thereof that perform the identical function." *Id*. at 1214. The Court based its holding on the fact that the lever moving element was "described in terms of its function not its mechanical structure." *Id.* Here too, the term "smoothing element" is described in terms of its function ("smoothing") instead of its structure. Thus, it should be construed as limited to the embodiments disclosed in the specification and their structural equivalents. 3D may point to the fact that claim 2 describes the "smoothing element" as "having a plurality of substantially separate members" and argue that the recitation of such "members" includes sufficient structure to avoid the use of "means-plus-function" claim interpretation rules

under Section 112, paragraph 6. However, "members" does *not* connote additional structure. Claim 2 generically recites the use of "members" to further describe the *function* of the smoothing element (i.e., the members are "for contacting the building material"). In *Mas-Hamilton*, the Federal Circuit also addressed the term "member" in the claim limitation "movable link member." As with "lever moving element," the Court held that "movable link member" was properly construed as a means-plus-function element because the term lacked sufficient structure. *Id*. at 1214-1215. Thus, the recitation of a "plurality of substantially separate members" does not add sufficient structure to "smoothing element" to avoid means-plus-function treatment.

3D may also attempt to argue that the recitation of a "winged blade" in claim 2 connotes sufficient structure to avoid Section 112, paragraph 6. However, the winged blade is recited as an *additional limitation* in claim 2. The limitations of claim 1--including the "smoothing element"--are independent of those recited in claim 2. Thus, the "winged blade" limitation of claim 2 must further *limit* the scope of claim 1. It cannot broaden it. A "means-plus-function limitation is not made open-ended by the presence of another claim specifically claiming the disclosed structure which underlies the means clause or an equivalent of that structure." *C.R. Bard, Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 1364 (Fed. Cir. 1998) (citations omitted). *See also* 35 U.S.C. § 112, ¶ 4 ("[A] claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject claimed. A claim in independent form shall be construed to incorporate by reference all the limitations of the claim to which it refers").

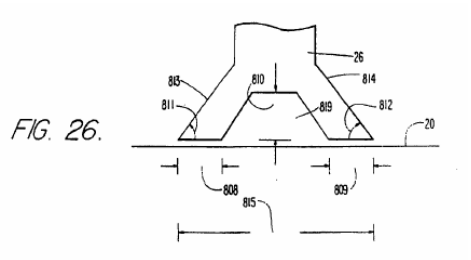
Given the foregoing, the proper construction of "smoothing element' first requires a construction of "smoothing" and then an identification of the corresponding structure in the specification. The term "smoothing" refers to the sweeping away of excess curable liquid to create a level surface. The specification of the '934 Patent establishes that the term "smooth" is used synonymously with the term "level":

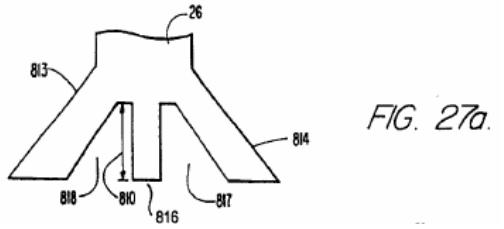
> Typically, the cured layer, which is supported on a vertically movable object support platform, is dipped below the surface of a bath of the viscous polymerizable liquid a distance greater than the desired layer thickness so that liquid flows over the previous cross-section rapidly. Then, the part is raised to a position below the surface of the liquid equal to the desired layer thickness, which forms a bulge of excess material over at least a substantial portion of the previous cross-section. When the surface **levels (smooths out)**, the layer is ready for curing by radiation.

The '934 Patent at 2:10-19 (Exh. 3) (emphasis added). The specification also describes the use of a "doctor blade" to perform the smoothing function by striking off excess liquid: "Doctor blade 26 is moved horizontally so that the lower edge 35 thereof strikes off excess polymerizable liquid from the layer 34 and thereby **smooths** [sic] the upper surface (36) of the coating of material over surface 15." *Id*. at 8:58-62 (emphasis added). Further, "one or more passes by doctor blade 26 may be needed at a particular speed to provide a **smooth level** upper surface 36 of coating 34." *Id*. at 8:64-66. Numerous other portions of the specification confirm that "smoothing" refers to the creation of a level surface. *See e.g., Id.* at 9:1-2 ("the upper surface 36 of layer 34 is leveled by the doctor blade 26"). Thus, the term "smoothing" is properly defined as sweeping away excess liquid to create a level liquid surface.

As claim 2 indicates, the claimed "smoothing element" has a "plurality of substantially separate members." Accordingly, the corresponding embodiments of the "smoothing element"

are those depicted in Figures 26 and 27(a) of the '934 Patent. 3D's claim chart confirms that Figures 26 and 27a are the two disclosed embodiments of the "smoothing element" recited in claim 2:





3D's construction of "sweeping a smoothing element" is "moving an element across the uncured building material to sweep away excess material to smooth the surface of the uncured building material." 3D's construction circularly recites "smooth" and "element" and provides no additional guidance to the Court or the jury. In addition, 3D fails to account for the fact that "smoothing element" is properly construed as a means plus function element.

8. "**Said Smoothing Element Having a Plurality of Substantially Separate Members**"

Given the foregoing construction of "smoothing element," this phrase needs no additional construction. The phrase "substantially separate members" is properly construed in accordance with means-plus-function claiming rules because the term "members" does not connote sufficient structure, but rather, is used only to describe a function ("contacting the building material"). *Mas-Hamilton*, 156 F.3d at 1214-1215. 3D's construction—"the smoothing element has at least two members which are spaced apart from each other"—does not conform to means-plus-function claiming rules. Moreover, it circularly uses the term "members."

9. **Applying a Prescribed Pattern of Synergistic Stimulation**"

As discussed in Section III.B.1, above, the specification of the '934 Patent clearly limits the scope of the claimed invention to the use of radiation beams that draw a radiation pattern as they move across the surface of a curable liquid. Accordingly, this phrase should be construed to mean "**moving a beam of radiation across selected locations on the surface of a curable liquid to draw a radiation pattern thereon**." *See also* Section III.B.5, above (construing "exposure to prescribed synergistic stimulation"). The term "prescribed" refers to the fact that the specific locations traversed by the beam of radiation are dictated by the contours of the cross-section being drawn.

3D's construction--"subjecting the building material to a specified pattern of (1) electromagnetic radiation . . . ; or (2) particle beams; or (3) reactive chemicals . . . ." ignores the numerous specification statements that limit the scope of the '934 Patent to the use of radiation beams that traverse the surface of a curable liquid to draw a radiation pattern. 3D's construction also ignores 3D's admission in the *Aaroflex* lawsuit that stereolithography methods such as claim 2 are so limited. 3D's Aaroflex Trial Brief at 1 (Exh. 6).

10. **"Form the Subsequent Layer**"

This phrase refers back to the phrase "a subsequent layer . . . is formed" earlier in the claim. For the reasons provided in Section III.B.2, this phrase should be construed to mean "**solidify the new object section of constant thickness**."

11. "**Sweeping a Winged Blade**"

This phrase should be construed to mean "**sweeping away excess curable liquid by moving the blade of Figure 26, or structural equivalents thereof, across the surface of the curable liquid to create a level surface**." As discussed in Section III.B.7, the claimed "smoothing element" should be construed in accordance with 35 U.S.C. § 112, ¶ 6 and limited to the blade structures of Figures 26 and 27a of the '934 Patent. The "winged blade" limitation is an additional limitation that is recited in dependent claim 2 (but not in claim 1, the independent claim from which claim 2 depends), and accordingly, it must further *limit* the scope of the claimed "smoothing element" to the embodiment of Figure 26 and its structural equivalents. *See* C.*R. Bard, Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 1364 (Fed. Cir. 1998); *see also* 35 U.S.C. § 112, ¶ 4 *See* 35 U.S.C. § 112, ¶ 4.

3D's construction--"a side of at least one of the two members is at an angle with respect to the surface of the material"--improperly broadens the "smoothing element" recited in claim 1. In addition, 3D's construction has no basis in the specification. The only embodiment of a "winged blade" identified by 3D has *two* members angled at an angle with respect to the surface of the curable material. Thus, there is no basis for broadening "winged blade" in the manner suggested by 3D.

C. <u>The '537 Patent (Claim 81)</u>

The asserted paradigm claim from the '537 Patent is claim 81. Defendants' constructions of the disputed claim language from the '537 Patent are set forth below.

1. "**Forming At Least a Portion of a Three-Dimensional Object**"

This phrase should be construed to mean "**moving a beam of radiation across the surface of a curable liquid to create part or all of a solid object by drawing a radiation pattern thereon**." According to 3D, "Claim 81 of the '537 Patent claims a *stereolithographic* apparatus . . . ."[11] In addition, the specification indicates that the '537 Patent is limited to stereolithography processes. The Background of the Invention states that "the current invention is directed primarily to step (4)" of a seven step "*stereolithographic* embodiment." The '537 Patent at 1:29-60 and 2:36-39 (Exh. 4) (emphasis added). The Field of the Invention states that "The current invention relates generally to the field known as rapid prototyping and manufacturing ("RP&M"), *stereolithography*, or solid imaging . . . . " *Id.* at 1:9-13 (emphasis added). The only embodiment of the claimed apparatus that is specifically described is a "stereolithographic apparatus SLA." *See Id.* at 7:6-7 ("FIG. 1 generally depicts a stereolithographic apparatus ('SLA') 10"); *Id*. at 22:53-56 ("Recoater 100 may be mounted to the SLA"); *Id*. at 32:34-36 ("Applicator 210 may again include envelope 212 which may be attached to the SLA by a frame (not shown) to provide translation across surface 22"); *Id*. at 37:65 ("Applicator 310 may be coupled to the SLA").

As explained above, 3D has admitted that "A stereolithography system" is one in which "data is [ ] used to ***direct an ultraviolet laser***, whose beam solidifies the surface of a photosensitive liquid." 3D's Aaroflex Trial Brief at 1 (Exh. 6). In addition, the '537 Patent

[11] Plaintiff 3D Systems, Inc.'s Memorandum of Points and Authorities in Support of 3D's Motion for Summary Adjudication of Literal Infringement re: U.S. Patent No. 5,902,537 Claims 17, 18, 81, 82; U.S. Patent No. 5,174,931 Claim 5, 19, 52, dated January 12, 2001 ("3D's MSJ re: the '537 Patent") (Exh. 16) at 3, from *3D Systems, Inc. v. Aaroflex, Inc.*, Case No. 97-0231 AJW (C.D. California).

incorporates by reference several patents which state that the claimed invention is limited to stereolithography and that stereolithography is defined by the use of radiation beams that draw a radiation pattern on the surface of a curable liquid as they move across it.[12]

For example, the '537 Patent incorporates by reference U.S. Patent No. 4,575,330 (the "'330 Patent"). The '537 Patent at 1:25-29 (Exh. 4). As discussed previously, the '330 Patent states that "while a variety of stereolithographic systems have been disclosed for the practice of the present invention, they all have in common the concept of *drawing* upon a substantially two-dimensional surface and extracting a three-dimensional object from that surface . . . ." The '330 Patent at 11:55-60 (Exh. 14) (emphasis added). The Summary of the Invention in the '330 Patent states that in stereolithography "a programmed movable spot beam of UV light shining on a surface or layer of UV curable liquid is used to form a solid cross-section of the object at the surface of the liquid." *Id.* at 2:37-43 (Exh. 14). It further states that the UV light is "applied as a graphic pattern." *Id.* at 3:1-7. The '330 Patent also makes several references to "the stereolithographic apparatus of *the present invention*." *Id.* at 3:30-31; 3:67-68; and 8:34-35 (Exh. 14). *See also, Id.* at 4:68 (Exh. 14) ("This invention, referred to as stereolithography").

The '537 Patent also incorporates by reference U.S. Patent No. 5,184,307 (the "'307 Patent"). The '537 Patent at 1:25-29 (Exh. 4). The '307 Patent states that "stereolithography is a three-dimensional printing process which uses a moving laser beam to build parts by solidifying

[12] As mentioned previously, "Incorporation by reference provides a method for integrating material from various documents into a host document . . . by citing such material in a manner that makes clear that the material is effectively part of the host document as if it were explicitly contained therein." *Cook Biotech, Inc. v. Acell, Inc.*, 460 F.3d 1365, 1376 (Fed. Cir. 2006). Therefore, the portions of the '330 Patent and '307 Patent which repeatedly emphasize that the "invention" is limited to stereolithography and that stereolithography involves the use of a moving radiation source to draw a radiation pattern must be treated as if they were explicitly set forth in the body of the '537 Patent.

successive layers of liquid plastic." The '307 Patent at 5:50-53 (Exh. 17). "When parts are built using stereolithography, resin is cured by exposing its surface with a laser that traces the appropriate pattern . . . ." *Id.* at 51:43-46. "The laser scanner, the photopolymer vat and the elevator, along with a controlling computer, combine together to form a stereolithography apparatus, referred to as an 'SLA.' An SLA is programmed to automatically make a plastic part by drawing one cross section at a time, and building it up layer by layer." *Id*. at 2:30-35. Like the '330 Patent, the '307 Patent states that each of the disclosed "stereolithographic systems" has "in common the concept of drawing upon a two-dimensional surface and extracting a three-dimensional object from that surface." *Id*. at 99:39-43.

Given the emphasis on stereolithography in the Field of the Invention, the Background of the Invention, and in the patents that 3D incorporated by reference, one of ordinary skill in the art would understand that the '537 Patent is limited to stereolithographic processes that use a radiation beam to draw a radiation pattern as it moves across the surface of a curable liquid. 3D cannot legitimately deny this fact since it *admitted* that claim 81 of the '537 Patent is limited to a "stereolithographic apparatus" in its earlier lawsuit against Aaroflex. [13]

3D's construction of "forming at least a portion of a three-dimensional" object is "forming a part or all of a product, prototype, or model which has three dimensions." 3D's construction is flawed for several reasons. First it is tautological and circularly uses the term "forming." Second, it fails to account for the fact that the '537 Patent is limited to stereolithographic processes and that by definition such processes involve moving a radiation beam across the surface of a curable liquid to draw a radiation pattern. Third, it files in the face

[13] 3D's MSJ re: the '537 Patent at 3 (Exh. 4.)

of 3D's admission in *Aaroflex* that claim 81 is limited to *stereolithographic apparatuses*. "The public is entitled to take the patentee at his word and the word was that the invention is [stereolithography]." *Honeywell International, Inc., et al., v. ITT Industries, Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006).

2. "**Cross-Sectional Basis**"

This phrase should be construed to mean "**sequentially solidifying adjacent, horizontally-sliced object sections of constant thickness**." As 3D admitted in the Aaroflex case, stereolithography is defined by the slicing of an object into cross-sections. 3D's Aaroflex Trial Brief at 1 (Exh. 6). The '537 Patent does not define the term "cross-sectional basis." However, every reference to "cross-section" refers to a horizontally-sliced object section of constant thickness. For example, in describing Figure 1, the specification states that the "Object 12 is formed of successive cross-sections which are shown by the dashed lines." The '537 Patent at 7:13-15 (Exh. 4). As Figure 1 indicates, each referenced cross-section is a horizontal slice of the object having a constant thickness:

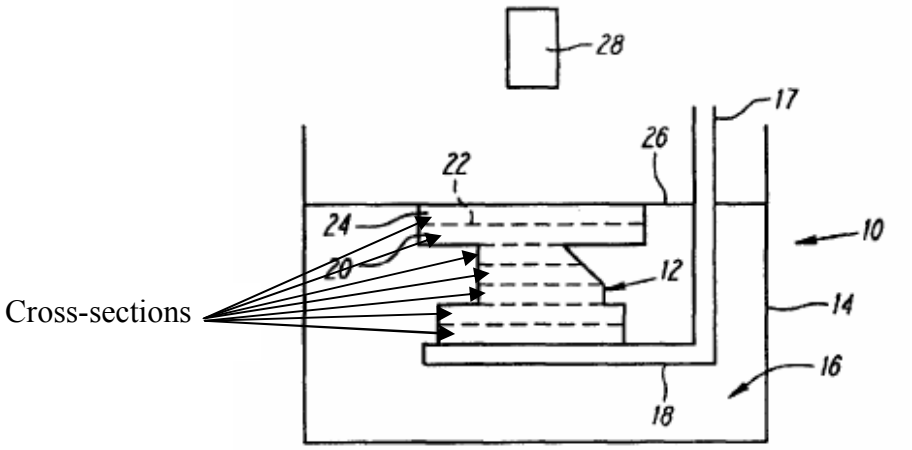


FIG. 1

The specification also makes clear that the layers defining the cross-sections are of a single, constant thickness. For example, in describing Figure 1, the specification refers to "***the*** thickness of the layer 24 . . . ." *Id.* at 38:50-51. The Background of the Invention states that "it is important that the building material is uniform and of appropriate thickness . . . ." *Id*. at 2:47-48. The Background of the Invention also criticizes "prior approaches" for their "varying degrees of layer accuracy and nonuniformity." *Id*. at 2:42-44. In addition, object cross-sections are described as "thin 'slices,' each representing a thin cross-sectional layer of the three-dimensional object." The '537 Patent at 1:34-36 (Exh. 4).

As mentioned in Section III.C.1, above, the '537 Patent incorporates the '307 Patent by reference. The '307 Patent further confirms that "cross-sectional basis" refers to the sequential solidification of horizontally-sliced object sections of constant thickness." For example, Figure 11 describes the process for slicing the object into horizontal sections and then solidifying the individual sections with a laser beam:

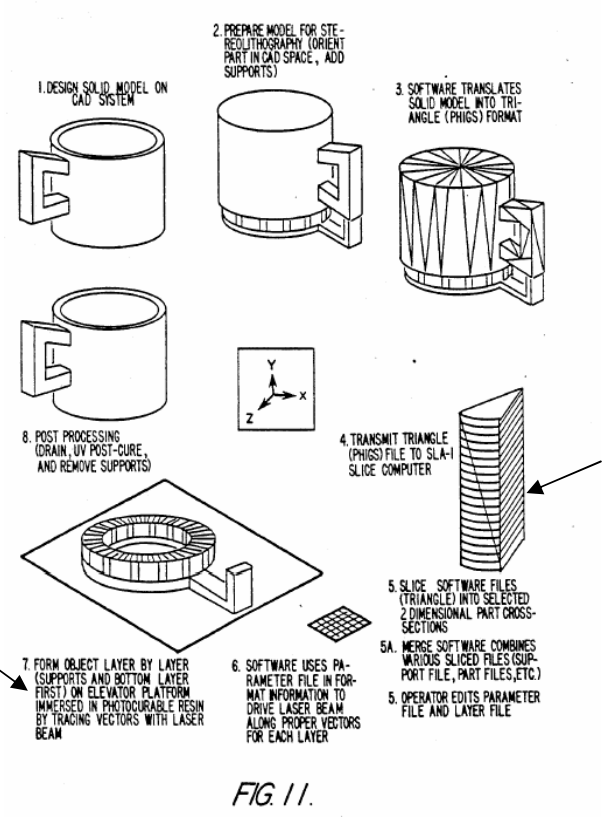


FIG. 11.

Horizontal slices of uniform thickness

Laser traces vectors defined by slices

Figure 15 more particularly depicts the process of slicing the part as follows:

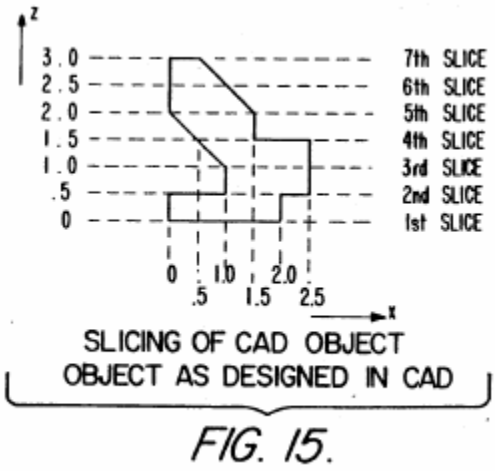


FIG. 15.

The '307 Patent specification also explains that "The stereolithography operating parameters include selection of the model scale and layer (slice) thickness" and that "The

software of the stereolithographic system slices the [object] horizontally (X-Y plane) at ***the*** *selected layer thickness*." The '307 Patent at 6:3-5 and 6:15-18 (Exh. 17) (emphasis added). "The layer thickness is *the* thickness between successive cross-sections in the created part." *Id*. at 61:5-6 (emphasis added). After the slicing is complete, "The SLA [stereolithographic apparatus] then forms the object *one horizontal layer* at a time by moving the UV beam of a helium cadmium laser or the like across the surface of a photocurable resin and solidifying the liquid where it strikes." *Id*. at 6:28-31 (Exh. 17) (emphasis added). Other portions of the specification make clear that each cross-section is defined by a single thickness. *See Id*. at 4:24 ("the thickness of one layer"); *Id*. at 17:13-14 ("the thickness of one layer").

As discussed in Section III.A.5, above, dictionary definitions of "cross-section," confirm that a cross-section is defined by *planar* cuts that are transverse (i.e. at right angles) to an object axis, which necessarily yields layers of constant thickness. *See Oxford English Dictionary* (Exh. 11) at 1196 (def. V.B.) ("a section made by a plane cutting anything transversely"); *Webster's New Encyclopedic* Dictionary (Exh. 12) at 240 ("a section cut off at right angles to an axis by a plane"); *Webster's New World Dictionary* (Exh. 13) at 331 ("cutting through something, esp. at right angles to its axis"). In the context of objects being built in the vertical direction (or "z-direction"), these definitions clearly indicate that the referenced "cross-sections" in claim 81 of the '537 Patent are horizontal.

The specification of the '537 Patent is "the single best guide to the meaning of a disputed term." *Phillips v. AWH Corp., et al.,* 415 F.3d 1303, 1315 (Fed. Cir. 2005) (citations omitted). Here, the specification confirms that "cross-sectional basis" refers to sequentially solidifying adjacent horizontally-sliced object sections of constant thickness. *See also Old Town Canoe Co. v. Confluence Holdings Corp.*, 448 F.3d 1309, 1317-1318 (Fed. Cir. 2006) (relying on the

specification to conclude that the term "coalescence . . . is completed" was limited to the attainment of an "optimal state" of coalescence notwithstanding whether "a broader definition . . . may be found in a dictionary, treatise, or other extrinsic source").

3D's construction--"the object is built by adding successive cross-sections to one another"--is circular and provides no guidance as to the ordinary meaning of the term "cross-sections." Thus, it should be rejected, and Defendants' construction should be adopted.

3. "**Exposure to Synergistic Stimulation**"

This phrase should be construed to mean "**having a radiation pattern drawn thereon with a radiation beam that moves across the surface of a curable liquid**." As discussed in Section III.C.1, above, 3D admitted in the *Aaroflex* case that claim 81 of the '537 Patent is limited to stereolithographic processes that use a moving source of radiation. 3D's MSJ re: the '537 Patent at 3 (Exh. 16); 3D's Aaroflex Trial Brief at 1 (Exh. 6). The specification of the '537 Patent further indicates that the claims are so limited. As a result, the "exposure" referred to in claim 81 necessarily refers to a process of *drawing* (i.e., sequentially traversing a number of points) on a curable liquid with a moving radiation beam.

3D's construction of this phrase is "subjected to (1) electro-magnetic radiation . . . ; (2) particle beams; or (3) reactive chemicals . . . ." 3D ignores the ordinary meaning of "exposure" as evidenced by its prior admissions and the '537 Patent specification. Instead, 3D seeks to broaden "exposure" to mean "subjected to," notwithstanding the lack of any support in the specification. 3D "is not entitled to a claim construction divorced from the context of the written description . . . ." *Old Town Canoe Co. v. Confluence Holdings Corp.*, 448 F.3d 1309, 1318 (Fed. Cir. 2006). The specification makes clear that the "exposure" must occur via a drawing process.

3D may attempt to rely on the specification's varying descriptions of "synergistic stimulation" to support its construction. However, those portions do not inform the meaning of "exposure." In addition, they do not trump the specification's clear indication that the only form of "synergistic stimulation" covered by the claims is generated by moving radiation beams.

As discussed in Section III.B.1 above with respect to the '934 Patent, 3D may attempt to argue that "exposure to synergistic stimulation" must also encompass the "mask exposure" embodiment of Figure 5 of the '330 Patent. However, as discussed therein, such a construction would impermissibly render claim 81 invalid for lack of enablement.

Moreover, there is *no* mask exposure embodiment or other stationary radiation source embodiment of claim 81. As will be discussed in detail below, claim 81 recites an "applicator" and a "vacuum pump." The only disclosed embodiments that include an applicator and vacuum pump incorporate those features on a stereolithography apparatus (SLA). *See* the '537 Patent at 37:65 ("Applicator 310 may be coupled to the SLA"); *Id*. at 39:43-47 ("Each of these views depicts dimensions of an applicator of the type described herein as implemented on an SLA-250 stereolithographic apparatus"). Thus, Defendants' construction does *not* exclude an embodiment of claim 81.

4. "**Means for Supplying Data Descriptive of the Object**"

This phrase should be construed to mean "**a computer programmed to generate data files representing horizontally-sliced object sections of constant thickness**." This limitation is a "means plus function" limitation and is construed to encompass the structures in the '537 Patent and their structural equivalents which perform the claimed function of "supplying data descriptive of the object." *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1211 (Fed. Cir. 1998); 35 U.S.C. § 112, ¶ 6. 3D does not dispute that the limitation is a means-plus-function

limitation. However, 3D fails to properly identify the structure in the specification that corresponds to this limitation, asserting that it is simply a "CAD file for storing the design data representing the object." The remaining portions of claim 81 and the specification confirm that the referenced data must be sliced into horizontal object sections of constant thickness. It is the sliced data that is supplied to the stereolithographic apparatus to drive the movement of the beam of radiation.

In its lawsuit against Aaroflex, 3D confirmed that *this specific limitation* of claim 81 requires a computer configured to slice an object into thin cross-sectional layers:

> The specification of the '537 Patent explicitly describes an embodiment of the invention **including the steps of "slicing" three-dimensional object data** in a CAD file into **thin cross-sectional layers** and transferring the data to a stereolithographic apparatus. ('537, col. 1:29-38; col. 2:15-24) In addition, 3D incorporated by reference various U.S. patents, such as the '307 Patent, that describe means of supplying data descriptive of the object. ('537, col. 1:25-29; col. 2:24-31) The '307 Patent is exemplary: it discusses various means of supplying object descriptive data to a stereolithographic apparatus, such as by **transferring faceted CAD data in an .stl file to a UNIX-based computer included in the machine that slices the data** into multiple thin layers which are then used to control the machine to build a three-dimensional object layer by layer. ('307, col. 22:42-23:19, Fig. 10).[14]

"In a means-plus-function claim in which the disclosed structure is a computer, or microprocessor, programmed to carry out an algorithm, the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm." *WMS Gaming Inc. v. International Game Tech.,* 184 F.3d 1339, 1349 (Fed. Cir. 1999). The language of claim 81 and the '537 Patent specification clearly indicate that the

[14] 3D's MSJ re: the '537 Patent at 13 (Exh. 16) (emphasis added). Note: this section of 3D's MSJ deals with claim 17. However, the section that addresses claim 81 incorporates it by reference. *Id*. at 17.

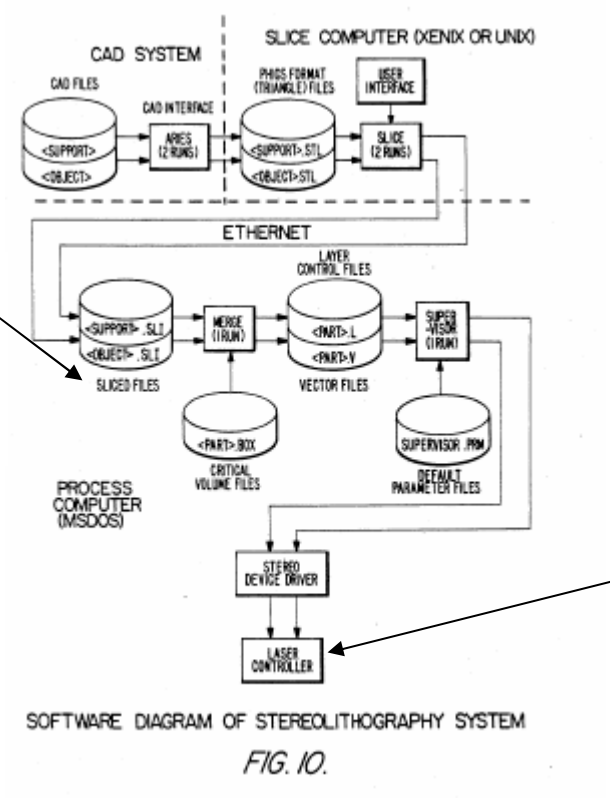
disclosed algorithm for the "means for supplying data . . . " supplies sliced data comprising horizontal object sections of constant thickness to the stereolithographic apparatus. As will be discussed below, claim 81 recites "a source of synergistic stimulation for *exposing the layers according to the descriptive data*." This portion of the claim dictates that the "data descriptive of the object" is the *same data* used to drive the radiation beam that draws a radiation pattern on the curable liquid. The '537 Patent specification confirms that the data used to drive the radiation beam is sliced object data because it is that data that is transferred to the stereolithographic apparatus ("SLA").

The Summary of the Invention describes the claimed stereolithographic process as follows:

> Appearing below is a summary of the basic steps of a stereolithographic embodiment:
>
> > 1. Generation of a three-dimensional object design in a CAD system and storage of the design data in a CAD file;
> >
> > 2. **Compiling data from the CAD file into numerous thin "slices" each representing a thin cross-sectional layer of the three-dimensional object**;
> >
> > 3. **Transfer of the compiled CAD data to a StereoLithographic Apparatus ("SLA")**;
> >
> > 4. Coating a layer of building material adjacent to a previously formed object cross-section in preparation for forming a subsequent object cross-section. The building material layer is preferably uniformly coated at an appropriate thickness so that the subsequently formed object cross-section meets tolerance requirements;
> >
> > 5. Selectively exposing the building material layer to synergistic stimulation to solidify or otherwise physically transform the building material layer at those locations which collectively represent the object cross-section to be formed . . . .

The '537 Patent at 1:29-60 (Exh. 4) (emphasis added).

As referenced above, the '537 Patent incorporates by reference the '307 Patent. *Id.* at 1:25-29. The '307 Patent further confirms that the "means for supplying data" include a computer programmed to slice the object into horizontal slices: "There are three computers needed to control the stereolithographic apparatus, a CAD system, a slice computer, and a process computer." The '307 Patent at 22:43-45 (Exh. 17). "The slice computer breaks down the CAD part into individual *horizontal slices*." *Id.* at 22:55-57 (emphasis added). "The slice computer may be a separate computer with its own keyboard and monitor. However, the slice computer may share a common keyboard and monitor with the process computer. The operator can vary the thickness of each slice and change other parameters of each slice with the User Interface program. The slice computer may use the XENIX or UNIX machine language and is connected to the SLA process computer by an Ethernet network data bus or the like." *Id.* at 22:60-68. Based on the sliced data, "the SLA then forms the object one horizontal layer at a time by moving the ultraviolet beam . . . across the surface of a photocurable resin . . . . " *Id.* at 6:28-31. "Each layer is comprised of vectors which are typically drawn in the following order: border, hatch, and surface." The '307 Patent at 6:34-36 (Exh. 17). Figure 10 of the '307 Patent further confirms that it is the *sliced data* that is supplied to drive the radiation beam (laser beam):



Sliced files are supplied to the SLA system's Process Computer

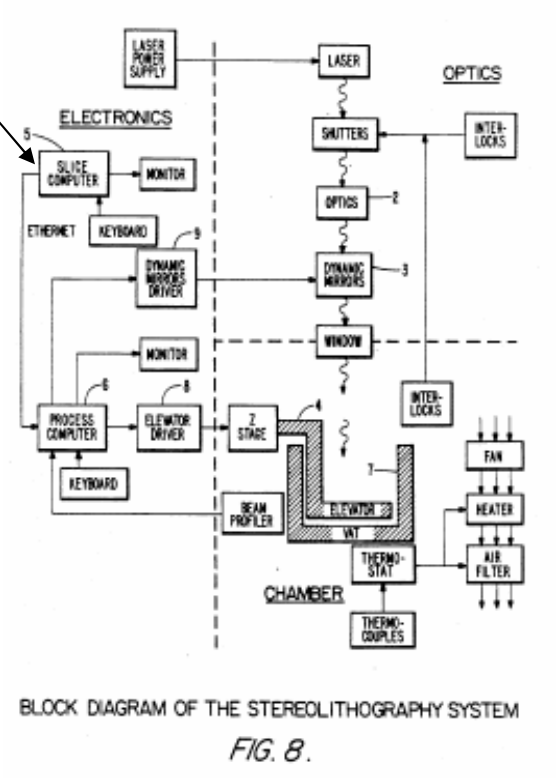
Laser controller directs the pattern of the laser beam to cure the liquid

Figure 8 of the '307 Patent depicts a block diagram of a stereolithography system. The system includes a computer programmed to provide sliced data files ("Slice Computer"). The description of the Slice Computer again confirms that it supplies the data that drives the radiation beam (laser beam):[15] "The SLICE computer converts the CAD/CAM data into a database of vectors, which are used to direct the movement of the laser beam on the surface of the photopolymer in the vat. A vector consists of 2 endpoints and a direction, and the directed laser beam will move from one endpoint to another on the surface of the photopolymer in the direction indicted by the vector." The '307 Patent at 53:49-56 (Exh. 17).

[15] In the embodiment of Figure 8, the Slice Computer performs the slicing and calculates the vectors that drive the stereolithographic apparatus. It then transfers the vectors to the process computer. The '307 Patent at 53:49-63 (Exh. 17). Regardless of whether the vectors are calculated by the Slice Computer or the Process Computer, the sliced data drives the curing process.

"[T]he major components of the system include laser 1 optics, 2, dynamic mirrors 3, Z-stage elevator 4, SLICE computer 5, PROCESS computer 6, vat 7, elevator driver 8, and dynamic mirror driver 9."

The '307 Patent at 53:29-33 (Exh. 17).



BLOCK DIAGRAM OF THE STEREOLITHOGRAPHY SYSTEM

FIG. 8.

As discussed in Section III.C.2, above, the slicing process generates horizontal slices of constant thickness. *See e.g.,* the '307 Patent at FIG. 10 and FIG. 15. Although certain embodiments allow the thickness to be varied as between different layers (see the '307 Patent at 75:35-54 Exh. 17), in all embodiments a given cross-sectional layer has a constant thickness.

5. "**An Applicator**"

3D's construction of this phrase is "**a device which applies and smoothes the building material**." Defendants agree with this construction.

6. "**Forming Layers"**

This phrase should be construed to mean "**depositing sections of constant thickness**." This limitation refers to the formation of layers of uncured (i.e., unsolidified material) prior to

drawing a radiation pattern. As discussed in Section III.C.2., the '537 Patent consistently indicates that the referenced "layers" are of constant thickness. For example, the Background of the Invention of the '537 Patent states that "the current invention is directed primarily to step (4)" of a "stereolithographic embodiment." The '537 Patent at 1:29-30 and 2:36 (Exh. 4). Step (4) states that "The building material is preferably uniformly coated at **an appropriate thickness** so that the subsequently formed object cross-section meets tolerance requirements." *Id.* at 1:41-45 (emphasis added). The Background of the Invention also emphasizes that "it is important that the building material is uniform and **of appropriate thickness** so that upon solidification, the resulting object cross-section exhibits dimensional accuracy." *Id.* at 2:47-50 (emphasis added). Other portions of the '537 Patent similarly make clear that a "layer" of building material is a section of constant thickness. *See Id.* at 7:45-46 (emphasis added) ("Platform 18 is then raised so that **the thickness of layer 24** approximates the desired thickness"); *Id.* at 7:65 (emphasis added) ("**The thickness** of the building material 24"). The specification also dictates that a radiation pattern is only drawn on the building material once it has formed a section of constant thickness:

"After roller 30 has swept across working surface 26 as shown in FIG. 2d, building material layer 24 may be impinged by synergistic stimulation from the source of synergistic stimulation 28."

The '537 Patent at 13:45-48 (Exh. 4).

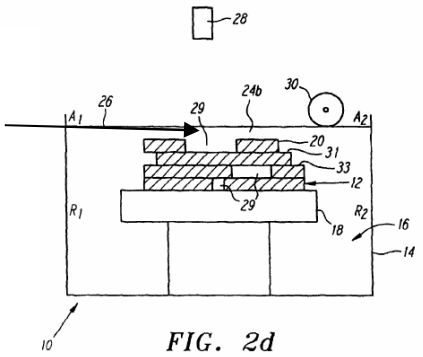


FIG. 2d

Other embodiments are in accord. *See Id.* at Figure 9b and 38:9-11. As discussed in Section III.A.5, above, dictionary definitions further confirm that a "layer" is a section of constant thickness.

3D's construction--"forming a thickness of unsolidified building material"--fails to account for the fact that the ordinary meaning of "layer" is limited to sections of constant thickness.

7. "**Over at Least Portions of Previously Formed Object Cross-Sections**"

This phrase should be construed to mean "**on top of part or all of previously solidified, horizontally-sliced object sections of constant thickness**." As indicated in Section III.C.2, above, the term "object cross-section" refers to a horizontally-sliced object section of constant thickness. The word "over" refers to the formation of building material on top of such object cross-sections. In every figure in the '537 Patent, building material is deposited on top of a previously solidified section. *See* the '537 Patent, FIGS. 1, 2a-2e, 3a, 4a, 4c, 5a, 5b, 6a, 6b, 7a, 7e, 7f, 9a, 9b, 9i, 9j (Exh. 4). The specification is in accord. *See Id.* at 7:15-17 (emphasis added) ("The last formed object cross-section 20 has a top surface 22 **on** which the next layer of building material is formed"); *Id*. at 5:14-17 (emphasis added) ("In a fourth embodiment, an applicator is used to apply a building material layer **from above** the object being formed"); *Id.* at 37:57-60 (emphasis added) ("applicator 310 is swept **at or slightly above** the desired working surface 26 while dispensing material from opening 315 to form building material layer 24").

3D's construction of "over at least portions of previously formed cross-sections" is "over at least parts of layers of building material that have been previously solidified." 3D's construction is flawed because it circularly uses the word "over" and because it fails to account for the ordinary meaning of cross-sections, i.e., horizontal slices of constant thickness. As the *Phillips* court indicated, the specification is the best guide to disputed claim language, and here it provides clear guidance as to the meaning of "over" and "cross-section." *Phillips v. AWH Corp., et al.,* 415 F.3d 1303, 1315 (Fed. Cir. 2005).

8. "**Vacuum Pump**"

This phrase should be construed to mean "**pump that exhausts gas from an enclosed space**." The term "vacuum pump" is not defined in the '537 Patent. However, dictionary sources indicate that it is a pump that exhausts gas from an enclosed space. *See Webster's New Encyclopedic Dictionary* (Exh. 12) at 1148; *Webster's New World Dictionary* (Exh. 13) at 1472. The specification implicitly indicates that the claimed vacuum pump exhausts air from an applicator, thereby causing liquid to be drawn up into the applicator. *See* the '537 Patent at 38:32-42 (Exh. 4). 3D's construction--"device which creates a difference in pressure" is flawed because it effectively writes out the term "vacuum" and instead only construes "pump."

9. "**Means for Sweeping the Applicator Across At Least a Portion of At Least Some of the Previously Formed Object Cross-Sections**"

This phrase should be construed to mean "**a frame and motor-driven threaded shaft that sweeps the applicator across all or part of at least some of the previously solidified, horizontally-sliced object sections**." The proper construction of "object cross-sections" in this limitation is addressed in Section III.C.2, above.

This is a means-plus-function limitation, and therefore, is construed to encompass those structures and their structural equivalents in the '537 Patent which perform the claimed function of "sweeping the applicator . . . ." *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1211 (Fed. Cir. 1998); 35 U.S.C. § 112, ¶ 6. 3D does not dispute that this limitation is a means-plus-function limitation. However, 3D's construction selectively writes out portions of the disclosed embodiment that are necessary for "sweeping the applicator," and therefore, is not properly based on the corresponding structure in the specification.

As 3D's claim chart indicates, the '537 Patent does not describe a specific "means for sweeping." Instead, it generically references a "frame and drive system" that is *not shown*. The '537 Patent at 37:65-67 (Exh. 4). To provide the necessary disclosure, the '537 Patent incorporates by reference U.S. Patent No. 5,174,931 (*Id.* at 3:9-33) which depicts the means for sweeping as follows:

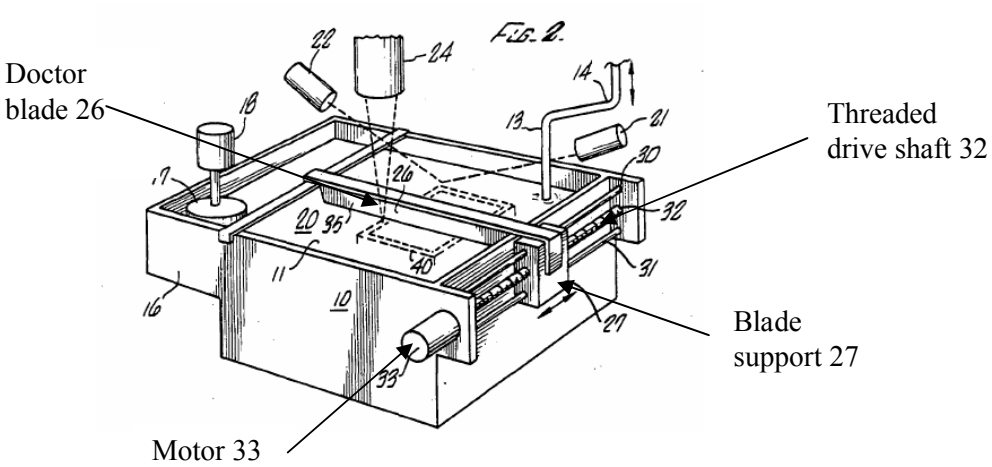


Figure 2 is described as follows:

> A doctor blade 26 is mounted on the top of the tank 10 and is adapted to move horizontally across the top of the tank. A blade support 27 is solidifiably mounted on rails 30 and 31 disposed along one side of the tank 10. A **threaded drive shaft 32 passes through a threaded passageway (not shown) in the blade support 27 and rotation thereof by motor 33 moves the blade support 27 and thus the blade 26 horizontally across the top of the tank 10**.

The '931 Patent at 8:17-26 (Exh. 18) (emphasis added).

The relevant "structure" for purposes of a means-plus-function limitation is the "corresponding structure necessary to accomplish the stated function." *Gemstar-TV Guide International, Inc., et al., v. International Trade Comm.*, et al., 383 F.3d 1352, 1361 (Fed. Cir. 2004). In *Gemstar*, the Federal Circuit affirmed an ITC claim construction that included a

"video switcher" as part of the structure corresponding to the claimed "means coupled to said television display for displaying the television schedule on said television display as a grid." *Id.* at 1361-62. In affirming the ITC's claim construction, the Court held that the video switcher was "integral to performing the stated function." *Id.* at 1362. Similarly, it is the motor-driven rotation of the threaded drive shaft 32 that causes the claimed applicator to sweep. Therefore, the construction of "means for sweeping . . . " must include the threaded shaft. 3D may argue that the '537 expressly references a "frame and drive system," and therefore, that the Court need provide no further construction of the nature of the drive. However, the only *structure* disclosed for performing the sweeping function is a motor-driven threaded drive shaft. The '537 Patent's cursory reference to a "frame and drive system" does not specify sufficient structure to perform the function of sweeping the applicator, as the word "drive" is functional, not structural. 3D acknowledges the lack of structure in the '537 Patent by including the '931 Patent's disclosure in its claim chart. 3D's construction--"frame and drive system"--fails to identify specific structure in contravention of 35 U.S.C. § 112, ¶ 6 and would render claim 81 invalid for indefiniteness. *See Kemco Sales, Inc., et al. v. Control Papers Co., Inc., et al.,* 208 F.3d 1352, 1360-61 (Fed. Cir. 2000) ("If a patentee fails to satisfy the bargain because of a failure to disclose adequate structure, the claim will be rendered invalid as indefinite under 35 U.S. section 112, paragraph 2"). In addition, 3D's construction fails to provide the proper construction of "object cross-sections," as discussed previously.

10. "**Source of Synergistic Stimulation**"

This phrase should be construed to mean "**a beam of radiation configured to move across the surface of a curable liquid and draw a radiation pattern thereon**" for the reasons provided in Sections III.C.1 and III.C.3, above.

11. "**Exposing the Layers According to the Descriptive Data**"

This phrase should be construed to mean "**moving a beam of radiation across the surface of a curable liquid to draw a radiation pattern on the unsolidified curable liquid sections of constant thickness according to the data files representing horizontally-sliced object sections of constant thickness**." As explained in Section III.C.4, above, the "descriptive data" that dictates the pattern of radiation drawn on the curable liquid comprises a representation of horizontally-sliced object sections of constant thickness. *See e.g.,* the '307 Patent at 22:55-57 (Exh. 17) ("The slice computer breaks down the CAD part into individual horizontal slices"); *Id*. at 62:59-64 ("In summary, the output of SLICE is a file containing vectors for use in directing the laser beam to traverse the surface of a liquid polymer to cure a cross-section of an object, and the vectors in the output file are organized according to the cross-sections to which they pertain"). As discussed in Sections III.C.1 and III.C.3, in the '537 Patent the word "exposure" refers to a process of drawing a radiation pattern on a curable liquid by moving a radiation beam across the surface of the liquid. As discussed in Section III.C.6, the referenced "layers" are uniformly thick sections of unsolidified building material.

3D's construction of "exposing the layers according to the descriptive data" is "subjecting the unsolidified thicknesses of building material to the synergistic stimulation in accordance with the design data representing the object." 3D's construction improperly equates

"exposing" and "subjecting," notwithstanding 3D's admission in *Aaroflex* that claim 81 is limited to stereolithographic apparatuses. 3D's construction is also inconsistent with the '537 Patent's specification, which limits the scope of the claimed invention to stereolithography. In addition, 3D's construction fails to account for the ordinary meanings of "descriptive data," and "layers, " as addressed previously in Sections III.C.2, III.C.4, and III.C.6.

12. "**Plurality of Object Cross-Sections**"

This phrase should be construed to mean "**several horizontally-sliced object sections of constant thickness**," for the reasons provided in Section III.C.2, above.

D. The '143 Patent (Claim 35)

The asserted paradigm claim of the '143 Patent is claim 35, a dependent claim that depends from claim 28. Defendants' interpretations of the disputed limitations of claim 35 are set forth below.

1. "**Producing a Three-Dimensional Object**"

This phrase should be construed to mean "**moving a beam of radiation across the surface of a curable liquid to create a solid object by drawing a radiation pattern thereon**." In its lawsuit against Aaroflex, 3D admitted that the '143 Patent is directed to stereolithography. Specifically, 3D stated that the "'143 Patent describes improved **stereolithography methods and systems** for building and using removable supports to temporarily support the three-

dimensional object being built."[16] In a motion for summary judgment directed to the '143 Patent and U.S. Patent No. 4,929,402, 3D stated the following:

> The term "stereolithography" is defined in both of the Patents as:
>
> > [A] method and apparatus for making solid objects by successively "printing" thin layers of a curable material, e.g., a UV curable material, one on top of the other. **A programmed movable spot beam of UV light shining on a surface or layer of UV curable liquid is used to form a solid cross-section** of the object at the surface of the liquid. The object is then moved, in a programmed manner, away from the liquid surface by the thickness of one layer, and the next cross-section is then formed and adhered to the immediately preceding layer defining the object. This process is continued until the entire object is formed.

3D's MSJ re: the '143 Patent at 5 (Exh. 19) (emphasis added). The foregoing definition is taken from the '143 Patent's Summary of the Invention. The '143 Patent at 4:30-41 (Exh. 5). The '143 Patent repeatedly states that the claimed invention is limited to stereolithography. For example, the Background of the Invention states that "This invention relates . . . more particularly to new and improved stereolithography system[s] . . . ." *Id.* at 1:64-67. *See also*, *Id.* at 3:61-4:2 ("the present invention provides a new and improved stereolithography system . . . . "); *Id*. at 9:29 ("This invention, referred to as stereolithography"). "Those statements are not descriptions of particular embodiments, but are characterizations directed to the invention as a whole." *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *12 (Fed. Cir. 2007). As a result, "[t]hose statements serve to limit the scope of the applicant's claimed subject matter"). *Id*. at *18.

[16] Plaintiff 3D Systems, Inc.'s Memorandum of Points and Authorities In Support of Its Motion for Summary Adjudication of Literal Infringement Re: U.S. Patent No. 4,929,402 Claims 16, 17, 23 and U.S. Patent No. 4,999,143 Claims 1 and 2, dated January 8, 2001 ("3D's MSJ re: '143 Patent") at 6 (Exh. 19) (emphasis added).

The '143 Patent also repeatedly states that stereolithography is defined by the use of a radiation beam that moves across the surface of a curable liquid to draw a radiation pattern. For example, the Background of the Invention describes the stereolithography process as one in which an "ultraviolet laser generates a small intense spot of UV. This spot is moved across the liquid surface with a galvanometer mirror X-Y scanner." The '143 Patent at 2:59-62 (Exh. 5). "The laser scanner, the photopolymer vat and the elevator, along with a controlling computer, combine together to form a stereolithography apparatus, referred to as 'SLA'." *Id*. at 2:65-68. "An SLA is programmed to automatically make a plastic part by **drawing** one cross-section at a time, and building it up layer by layer." *Id*. at 2:68-3:2 (emphasis added). "[S]tereolithography is a three-dimensional printing process which uses a **moving laser beam** to build parts by solidifying successive layers of liquid plastic." *Id*. at 5:40-43 (emphasis added). *See also Id*. at 6:19-22 ("The SLA then forms the object one horizontal layer at a time by moving the ultraviolet beam of a helium cadmium laser or the like across the surface of a photocurable resin and solidifying the liquid where it strikes"). The lengthy '143 Patent specification includes an operating manual for a stereolithographic process that provides the following definition:

> 1.2.1 Stereolithography Process. Stereolithography is a three-dimensional printing process which uses a **moving laser beam** to build parts by solidifying successive layers of plastic.

Id. at cols. 37-38. Figure 1-1 at cols. 39-40 also describes the "Key Steps in the Stereolithography Process," which include the following step: "Form object layer by layer . . . by tracing vectors with **laser beam**").

Furthermore, the only embodiments of the invention described in the specification are stereolithographic embodiments utilizing a moving radiation beam, as depicted in Figure 4:

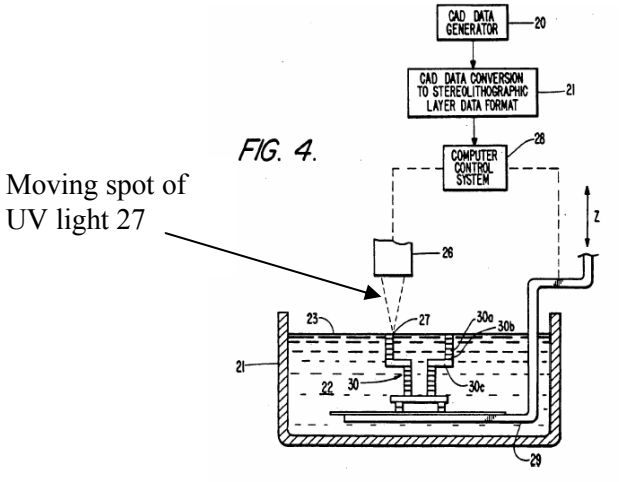


FIG. 4.

Moving spot of UV light 27

"A programmable source of ultraviolet light 26 or the like produces a spot of ultraviolet light 27 in the plane of surface 23. The spot 27 is movable across the surface 23 by the motion of mirrors or other optical or mechanical elements (not shown in FIG. 4) used with the light source 26." The '143 Patent at 11:50-55 (Exh. 5). "[S]ource 26 is arranged so it can be programmed to be turned off and on, and to move, such that the focused spot 27 moves across the surface 23 of the liquid 22. Thus, as the spot 27 moves, it cures the liquid 22 into a solid, and 'draws' a solid pattern on the surface in much the same way a chart recorder or plotter uses a pen to draw a pattern on paper." *Id*. at 12:54-61.

"It is difficult to imagine how the ['143] patent[ ] could have been clearer in making the point that [stereolithography] was a necessary element of every variant of the claimed invention." *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1344 (Fed. Cir. 2001). Thus, the process of "producing a three-dimensional object" is necessarily limited to the use of radiation beams that move across the surface of a curable liquid to draw a radiation pattern. *See Honeywell International, Inc., et al. v. ITT Industries, Inc.*, et al., 452 F.3d 1312, 1319 (Fed. Cir. 2006); *Phillips v. AWH Corp., et al.,* 415 F.3d 1303, 1316 (Fed.

Cir. 2005) ("[T]he specification may reveal an intentional disclaimer or disavowal of claim scope. In that instance as well, the inventor has dictated the correct claim scope, and the inventor's intention, as expressed in the specification, is dispositive").

3D's construction of "producing a three-dimensional object" is "producing a product, prototype, or model which has three dimensions." 3D's construction is circular and ignores the fact that the claimed apparatus is limited to stereolithography.

2. "**Exposure to Synergistic Stimulation**"

This phrase should be construed to mean "**having a radiation pattern drawn thereon with a radiation beam that moves across the surface of a curable liquid**." As explained in Section IV.D.1, the '143 Patent makes clear that the claimed invention is limited to stereolithography. Thus, the phrase "exposure to synergistic stimulation" should be construed accordingly.

3D's construction of this phrase is "subjected to (1) electro-magnetic radiation . . . ; or (2) particle beams; or (3) reactive chemicals . . . ." 3D's construction fails to account for the ordinary meaning of "exposure" as evidenced by its own admissions in the Aaroflex case and in the '143 Patent specification. In both instances, 3D clearly indicated that the claimed type of "exposure" is limited to processes that *draw* a radiation pattern (i.e., sequentially traverse locations) across the surface of a curable liquid. 3D ignores the meaning of "exposure" and substitutes "subjected to," notwithstanding the fact that there is no basis in the specification for doing so. 3D may argue that Defendants' construction is inconsistent with the forms of synergistic stimulation listed in the specification. However, 3D's clear statements about the scope of the claimed invention trump the specification's cursory references to other forms of

"synergistic stimulation." "The public is entitled to take [3D] at its word and the word was that the invention is [stereolithography]." *Honeywell International, Inc, et al., v. ITT Industries, Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006).

Furthermore, the specification excerpts cited by 3D only deal with forms of "synergistic stimulation" not methods of exposure. Thus, such excerpts do not support a claim construction that would read on processes other than those in which the synergistic stimulation is "drawn" across the surface of the building material (i.e., in which the synergistic stimulation sequentially traverses locations on the building material).

In addition, to construe the '143 Patent claims to cover embodiments other than stereolithography would render them invalid for lack of enablement and/or failure to comply with the written description requirement. Thus, such constructions are improper. *Wang Laboratories, Inc. v. America Online, Inc., et al.,* 197 F.3d 1377, 1383 (Fed. Cir. 1999) ("[I]n order to be covered by the claims that subject matter must be sufficiently described as the applicant's invention to meet the requirements of section 112"). The only embodiments that are developed and described in the specification are stereolithographic embodiments using a moving source of radiation. Although the '143 Patent specification mentions forms of synergistic stimulation other than moving sources of radiation, "Such a minimal dropping of an unenabled reference to an undeveloped system does not support a claim to it." *Medtronic Navigation, Inc., et al., v. Brainlab Medizinische Computersysteme GmbH, et al.*, 2007 U.S. App. LEXIS 2521 at*11 (Fed. Cir. 2007) (non-precedential).

3. "**From an Object Representation**"

This phrase should be construed to mean "**from data files representing horizontally-sliced object sections of constant thickness**." 3D has not provided a construction of this phrase.

As mentioned previously, in its lawsuit against Aaroflex, 3D admitted that in a stereolithography system, "a computer . . . receives data describing the three-dimensional object to be built and 'slices' it to produce data describing cross-sections. *That* data is then used to direct an ultraviolet laser, whose beam solidifies the surface of a photosensitive liquid." 3D's Aaroflex Trial Brief at 1 (Exh. 6) (emphasis added).

The '143 Patent confirms that the data used to drive the process of solidifying a curable resin is *sliced* data. First, the "object representation" referred to in the above-referenced limitation is again referred to later in claim 35 in the "means for . . . forming said three-dimensional object out of said medium . . . in accordance with said object . . . representation[]." The specification makes clear that the claimed "object representation" is in the form of sliced data that is used to drive the curing process. For example, the Summary of the Invention describes the claimed process as follows:

> First, the solid model is designed in the normal way on the CAD System . . . .
> * * *
> The surface of the model is then divided into triangles . . . .
> ** *
> **The software of the stereolithographic system then slices the triangular sections horizontally (X-Y plane) at the selected layer thickness**.
> * * *
> The stereolithographic unit (SLA) next calculates the section boundary, hatch, and horizontal surface (skin) vectors.
> * * *
> The SLA then forms the object one horizontal layer at a time by moving the ultraviolet beam of a helium-cadmium laser or the like across the surface of a photocurable resin and solidifying the liquid where it strikes. Absorption in the

> resin prevents the laser light from penetrating deeply and allows a thin layer to be formed. Each layer is comprised of vectors which are typically drawn in the following order: border, hatch, and surface.

The '143 Patent at 5:49-50, 5:65-66, 6:6-9, 6:10-12, and 6:19-27 (Exh. 5) (emphasis added).

As indicated by the foregoing, the "object representation" from which the three-dimensional object is produced comprises horizontal slices of constant thickness. Furthermore, 3D's "statements are not descriptions of particular embodiments, but are characterizations directed to the invention as a whole." *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *12 (Fed. Cir. 2007). The '143 Patent explains that in the claimed apparatus "an approach akin to assembling a loaf of bread by gluing the slices back together is taken by the laser process." The '143 Patent at cols. 283-284 (Exh. 5).

The specific embodiments further clarify the proper meaning of "object representation." For example, in "FIG. 1 . . . there is shown a block diagram of an overall stereolithography system for practicing the present invention." *Id*. at 8:40-42.

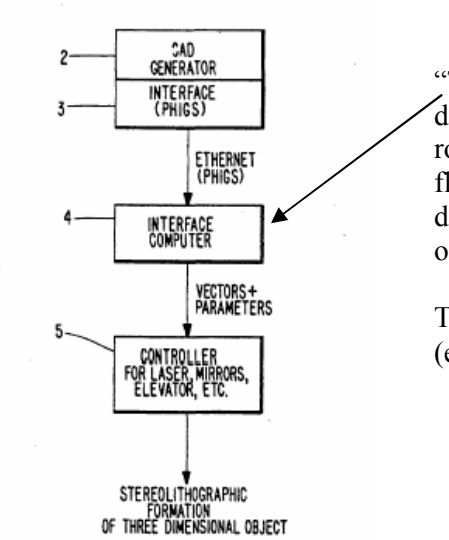


FIG. 1.

"The interface computer 4 generates layer data by **slicing**, varying layer thickness, rounding polygon vertices, filling, generating flat skins, near-flat skins, up-facing and down-facing skins, scaling, cross-hatching, offsetting vectors and ordering of vectors."

The '143 Patent at 8:51-55 (Exh. 5) (emphasis added).

As indicated above, the interface computer 4 slices the object data file and generates sliced data files which are then used to calculate vectors. "The vector data and parameters from the computer 4 are directed to a controller subsystem 5 for operating the system stereolithography laser, mirrors, elevator and the like." *Id.* at 8:56-59. Similarly, Figure 6 illustrates a software architecture in which a specific computer ("Slice Computer") is dedicated to creating the sliced object representation that drives the curing process. As Figure 6 indicates, it is the sliced object representation that is supplied to the process computer to drive the movement of the beam of radiation (laser):

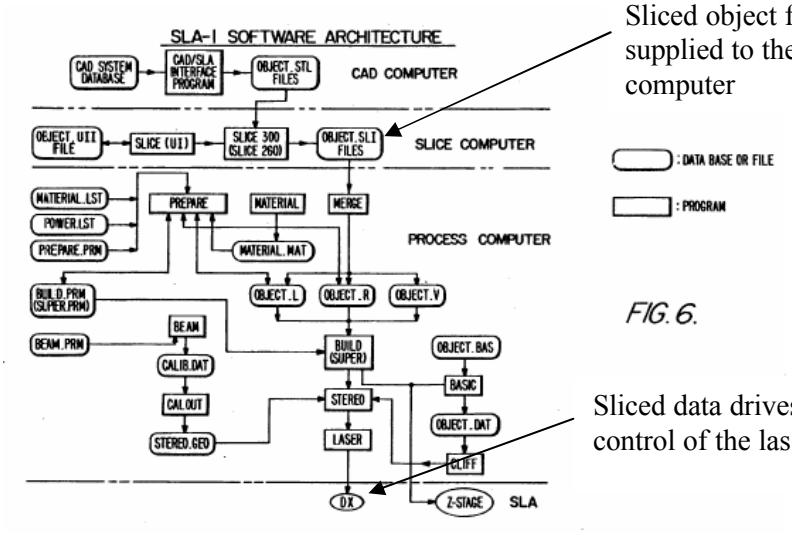
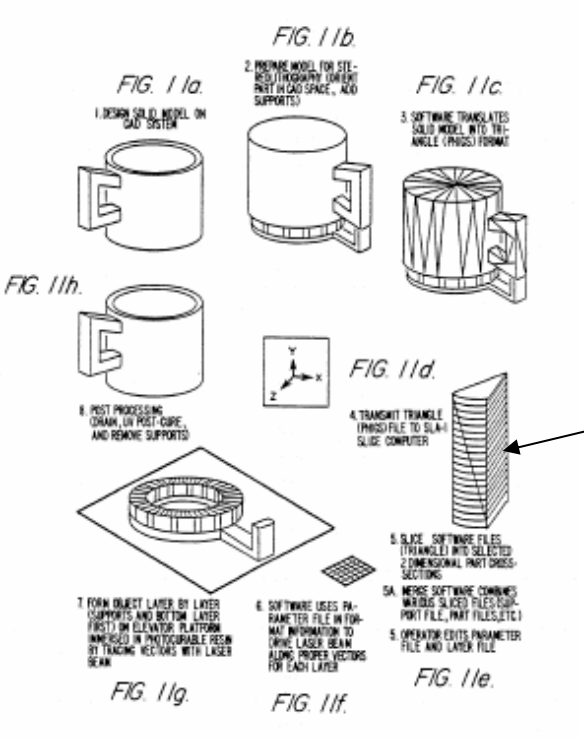


FIG. 6.

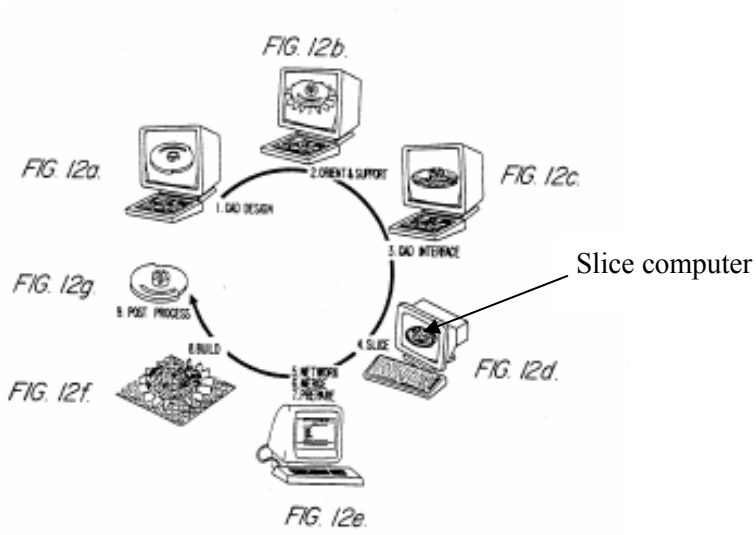
"SLICE defines each microsection or layer one at a time under certain specified controlling styles." *Id.* at 13:56-57. "SLICE 'slices' the original model mathematically which the laser then puts back together." *Id.* at cols. 283-284. "The laser must trace the outline of each slice and sweep across ('hatching') the interior off each slice." *Id.* "Therefore, the object ***must*** be reduced to cross-sections." *Id.* (emphasis added).

As indicated in 3D's claim chart, the '143 Patent incorporates by reference U.S. Patent Application No. 182,830, which issued as U.S. Patent No. 5,059,359 (the "'359 Patent"). The '359 Patent further confirms that the "object data" referred to in claim 35 is horizontally-sliced object data. For example, the '359 Patent states that "There are three computers needed to control the stereolithographic apparatus, a CAD system, a **slice computer**, and a process computer." The '359 Patent at 19:43-45 (Exh. 20) (emphasis added). "The stereolithography apparatus builds the part one layer at a time starting with the bottom layer. The slice computer breaks down the CAD part into individual horizontal slices. The slice computer also calculates where hatch vectors will be created." *Id.* at 19:54-58. "The sliced files are then transferred to the process computer through the Ethernet." *Id.* at 20:1-2. According to the '359 Patent, the "stereolithography process is *broadly* illustrated by the symbolic flow charts of FIGS. 11a-11h,[17] and 12a-12g." *Id.* at 20:20-22 (emphasis added). Both of these flow charts show that the "object representation" is a sliced object representation:

[17] Figures 11a-11h are also expressly included in the text of the '143 Patent at cols. 39-40 and are referred to as "Key Steps in the Stereolithography Process." (Exh. 5.)



As steps 5-7 of Figures 11a-11h indicate, the object is sliced into two-dimensional part cross-sections which are then used to form the object layer by layer. Similarly, Figures 12a-12g of the '359 Patent include a specific computer dedicated to performing the slicing operation:



The '359 Patent at FIGS. 12a-12g (Exh. 20). In addition, the '143 Patent confirms that each sliced cross-section of the claimed object data is of constant thickness.[18] For example, in the Summary of the Invention, the '143 Patent states that the "Stereolithography operating parameters include selection of the model scale and layer (slice) thickness." The '143 Patent at 5:62-64 (Exh. 5). It also states that the "software of the stereolithographic system then slices . . . at **the selected layer thickness**." *Id*. at 6:6-9 (emphasis added); *see also, Id.* at cols. 59-70 (emphasis added) ("The user must choose **the thickness** of each slice . . . . ."); *Id*. at cols. 1355-1356 (stating that "Layer Thickness . . . Defines the vertical slice thickness in CAD units"). The process is illustrated by Figure 15 of the '359 Patent, which as mentioned previously, is incorporated by reference in the '143 Patent:

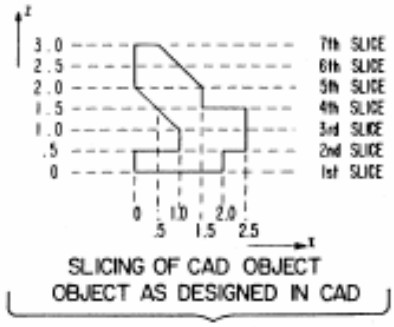


FIG. 15.

The '359 Patent, Figure 15 (Exh. 20). As the claim language and specification confirm, the claimed "object representation" comprises a data files representing horizontally-sliced object sections of constant thickness. This is the case for the invention generally and is not limited to a particular embodiment. Thus, "from an object representation" should be construed accordingly. *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *18 (Fed. Cir. 2007);

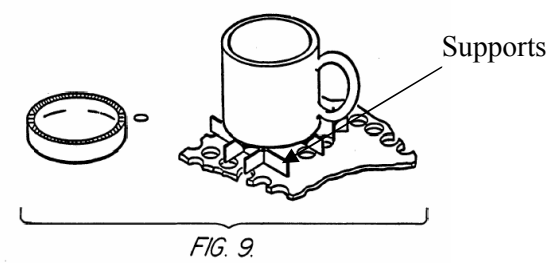
[18] Although, as between *different layers* the thickness may vary (*See* the '359 Patent at Fig. 22c), in any one given slice the thickness is constant.

see also Honeywell International, Inc., et al., v. ITT Industries, Inc., et al., 452 F.3d 1312, 1319 (Fed. Cir. 2006); *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001).

4. "**Computer Programmed to Form a Support Representation**"

This phrase should be construed to mean "**a computer programmed to provide data files representing horizontally-sliced sections of constant thickness of a structure that has a long, slender, rectangular cross-section and which provides reinforcement to the object or portions of the object**."

The '143 Patent specification limits the referenced "support representation" to: 1) supports that have a long, slender, rectangular cross-section, and 2) sliced data files, wherein each slice represents a horizontal support section of constant thickness. The '143 Patent's Summary of the Invention describes the claimed "supports" as follows: "In accordance with *the invention*, supports are provided in the form of 'WEBS'. Webs, in cross-section are *long slender rectangular structures*." The '143 Patent at 6:52-54 (Exh. 5) (emphasis added). Figure 9 of the '143 Patent illustrates web supports as follows:



The claimed supports are also described as a "thin, vertical web." *Id*. at 16:18-19. According to the specification, the reason for using the rectangular cross-sectional shape is that "Web supports are easy to remove during post processing . . . ." *Id*. at 16:19-20. In addition, 3D

criticized *other* support geometries in the Background of the Invention, further indicating that the term "support" is properly limited to long, slender, rectangular structures. *See Id*. at 3:11-40. The specification's statements concerning the use of web supports were global. They were not limited to particular embodiments. Thus, "they serve to limit the scope of [3D's] claimed subject matter." *Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 at *18 (Fed. Cir. 2007); *see also Honeywell International, Inc., et al., v. ITT Industries, Inc., et al.,* 452 F.3d 1312, 1319 (Fed. Cir. 2006); *Scimed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001).

"[T]he meaning of claim language may be limited by a disclaimer in the specification or prosecution history." *Atofina v. Great Lakes Chemical Corp.*, 441 F.3d 991, 997 (Fed. Cir. 2006). During the prosecution of the '143 Patent application, the claims were twice rejected, resulting in the issuance of a final office action on April 17, 1990.[19] Following the issuance of the Office Action, an interview was conducted with the Examiner on June 20, 1990. Interview Summary, dated June 20, 1990 (Exh. 21, Tab A). The Examiner summarized the substance of the interview as follows:

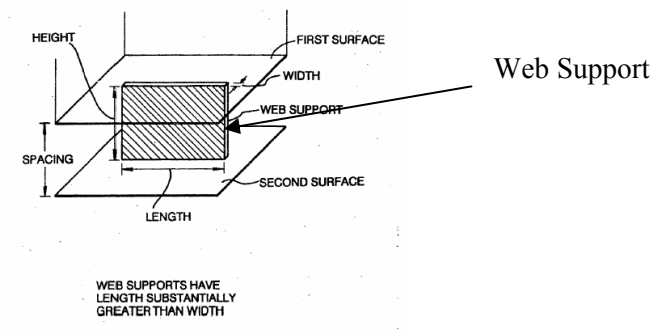
> Discussed how leg and mesh supports of European Patent [0 250 121] are different from **web supports of present application**. Proposed method claims appear allowable. Proposed apparatus claims need more consideration.

Id.

"At the interview, [3D] submitted four drawings to show how the web and polygonal supports **of the present invention** distinguished over the leg, point, and mesh supports disclosed in European Patent Application 0 250 121." Response after Final Rejection, dated August 21,

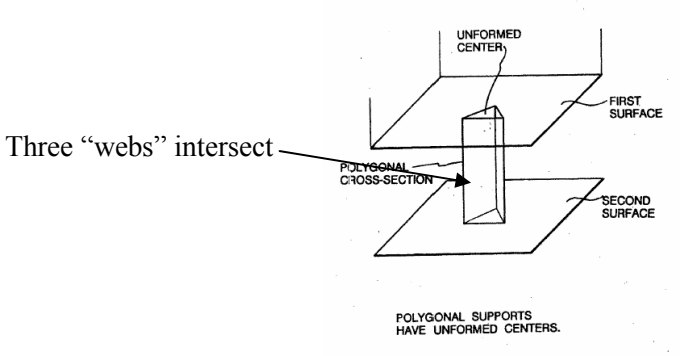
[19] Selected excerpts from the '143 Patent Application file history are submitted as Exh. 21. The referenced office action is included therein (Tab A).

1990 ("3D's Response") at 17 (Exh. 21, Tab C). One of the referenced figures "illustrated that web supports fit within a spacing between a first object surface and a second surface, and have a length substantially greater than width":



Exh. 21, Tab C (Figure 1)

The only other type of support that 3D indicated is "of the subject invention" during the Examiner interview is referred to as a "polygonal support." However, 3D explained that the polygonal support was simply a species of a "web support" in that "polygonal supports can be formed from a plurality of intersecting web supports." 3D's Response at 18 (Exh. 21, Tab C):[20]



Exh. 21, Tab C (Figure 3)

[20] 3D apparently addressed "polygonal supports" with the Examiner because some of the '143 Patent's claims specifically recite them (e.g., claim 7). The only supporting disclosure for such polygonal supports appears to be in one of the manuals appended to the '143 Patent specification. *See* the '143 Patent at cols. 1329 and 1320 (Exh. 5) ("Triangular Webs . . . are composed of three straight webs").

As the '143 Patent's file history indicates, during the Examiner interview, 3D showed the Examiner "several stereolithographically - produced parts, supported by web supports, point and leg supports, and mesh supports." 3D argued strenuously that the use of "web supports" distinguished the claimed invention from the prior art:

> Using these parts, Applicant first demonstrated **the distortion-reduction benefits of web supports** compared to the other supports. **The part supported by web supports exhibited little or no curl or birdnesting**, while the parts supported by point/leg supports exhibited both curl and birdnesting, and the part supported by mesh supports exhibited curl. In fact, one part supported by leg supports was unrecognizable since the legs supports fell through holes in the platform. Applicant also pointed out how the mesh supports did not adequately prevent sagging, nor did they properly support the part. In addition, it was pointed out that an impractical number of independent point or leg supports would be required to support the part adequately, or to prevent birdnesting. It was also pointed out that point supports in general have been found not to be strong enough to reduce curl, since the curl typically rips these supports off the platform, and that leg supports would be required to prevent this. However, leg supports would not be acceptable for fragile parts, since removing these supports would tend to break the part. **Web supports by contrast generally have the strength to reduce curl**, and typically also are easily removable from even fragile surfaces without harming them.

3D's Response at 19 (Exh. 21, Tab C).

During the interview, 3D discussed several apparatus claims with the Examiner. One of the claims was submitted as claim 100 with 3D's Response to the Final Office Action. Claim 100 issued as claim 28 in the '143 Patent, which is the independent claim from which paradigm claim 35 depends. *See* 3D's Response at 9, 19 (Exh. 21, Tab C). As the foregoing indicates, 3D's arguments to the Examiner were directed to the invention, generally. They were not limited to specific claims or embodiments. Thus, they represent a clear indication that the claimed invention is limited to "web" supports, i.e., supports having a long, slender, rectangular shape. *See Andersen Corp. v. Fiber Composites, LLC*, 2007 U.S. App. LEXIS 3108 (Fed. Cir. 2007) at *30-31 (limiting the term "composite structural member" to members prepared by

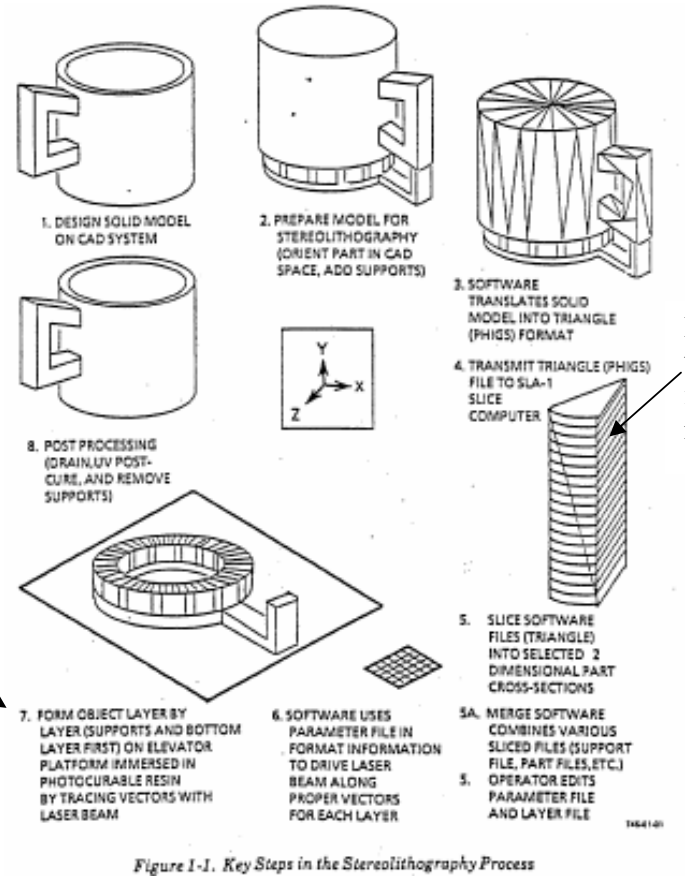
forming pelletized material because of arguments made to distinguish the prior art in the file history); *see also Atofina*, 441 F.3d at 997 (limiting "chromium catalyst" to catalysts that exclude metal oxides other than chromium and non-inert additives based on prosecution arguments).

As mentioned above, the claimed "support representation" refers to horizontally, sliced support sections of constant thickness. As with the "object representation" discussed in Section III.D.3, the "support representation" referred to in claim 35 is used for "forming said support out of said material substantially layer-by layer." The same stereolithographic process is used to create supports and the object. Claim 35 dictates that the "support representation," like the object representation, is used to form the support by driving the movement of the radiation beam across the surface of the curable liquid (i.e., the claim recites a "means . . . for forming said support . . . in accordance with said . . . support representation[]"). Thus, the support representation is necessarily a *sliced* data representation in order to drive layer-by-layer support formation.

The specification is in accord. For example, the Summary of the Invention for the '143 Patent states that "adding supports" is a step in the creation of the "solid model" of the object being built. The '143 Patent at 5:49-55 (Exh. 5). "[S]upports are designed together in a single CAD file separate from the part file. These stereolithography (.STL) files are then sliced, or cross-sectioned, before being merged into one file." *Id.* at 17:22-28.

The specification further makes clear that the sliced support files that define the "support representation" comprise layers of constant thickness, stating that "**the support slice thickness** must be evenly divisible by or identical to the slice thickness of the part file (in the overlap region)." *Id.* at 17:41-45 (Exh. 5) (emphasis added). The '143 Patent makes clear that the

slicing of the support data is not limited to a particular embodiment, but rather, is a key step in the *stereolithography process*:



Both the object and the supports are sliced in Step 5 and then merged in step 5A

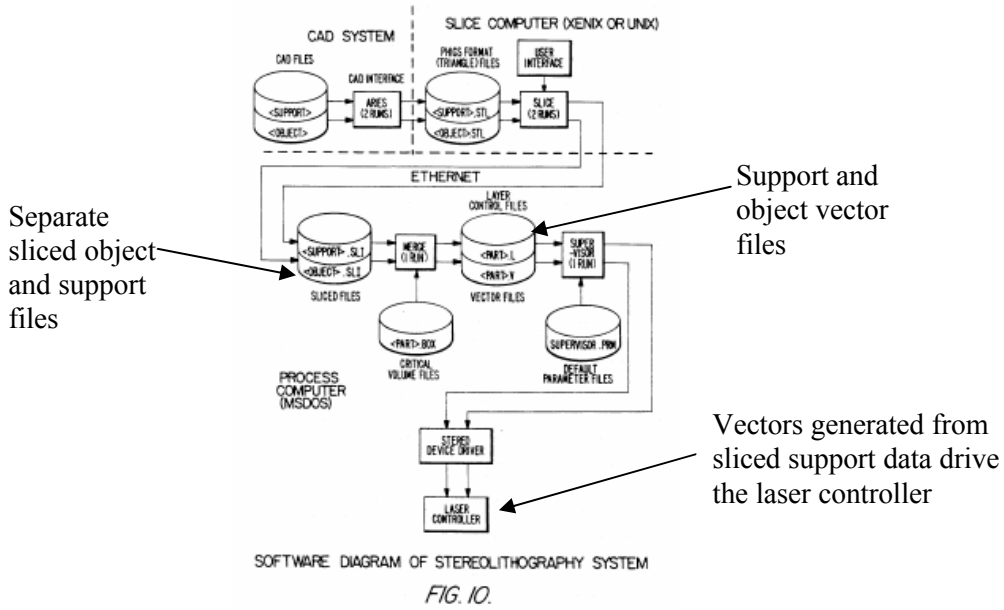
As with the object, the sliced support files drive the laser's creation of the supports

Figure 1-1. Key Steps in the Stereolithography Process

Id. at cols. 39-40. The '359 Patent, which is incorporated by reference in the '143 Patent, describes the process as follows:

> Any CAD system can be used to design a part in three-dimensional space. This is identified as the object file. In order to generate the part, supports must be added to prevent distortion. This is accomplished by **adding the necessary supports to the CAD part design and creating a CAD support file**. **The resultant two or more CAD generated files are then physically inserted into the slice computer** through Ethernet.
> * * *
> The slice computer breaks down the CAD part into individual horizontal slices.
> * * *
> The sliced files are then transferred to the process computer through Ethernet. The process computer merges the sliced object and support files into a layer control file and a vector file.

The '359 Patent at 19:45-53 (emphasis added); 19:55-57; and 20:1-4 (Exh. 20).[21] As Figure 10 indicates[22], the vector file is then used to drive the movement of the beam of radiation (laser beam):



SOFTWARE DIAGRAM OF STEREOLITHOGRAPHY SYSTEM

FIG. 10.

The '359 Patent, Figure 10 (Exh. 20). Thus, in the '143 Patent, the "support representation" that drives the curing process is consistently described as a horizontally-sliced representation of the supports. The '143 Patent makes global reference to the fact that like the object representation, the support representation must be sliced, and the patent does not limit the use of sliced support representations to any particular embodiment. Accordingly, the proper construction of "support representation" is limited to a horizontally-sliced representation.

3D's construction of "computer programmed to form a support representation" is a "computer having instructions to produce data relating to a support." 3D's construction fails to

[21] The same text is reproduced in the '143 Patent at cols. 55-56 (Exh. 5).
[22] Figure 10 of the '359 Patent is also reproduced directly in the text of the '143 Patent at cols. 57-58 (Exh. 5).

acknowledge the ordinary meaning of "support"--as reflected in the '143 Patent specification--and instead circularly uses the word "support." Moreover, 3D improperly attempts to broaden the scope of this limitation by using the phrase "relating to a support," notwithstanding that there is no basis in the '143 Patent for doing so. The phrase "relating to" is unbounded and untethered to the text of the specification or claims.

3D apparently intends to rely on the doctrine of claim differentiation to defend its construction, and therefore, cites claim 46 in its claim chart. Like paradigm claim 35, claim 46 depends from claim 28. Claim 46 reads as follows:

> 46. The apparatus of claim 28 wherein said support representation comprises support layer representations, and said at least one computer is programmed to form said support representation by slicing a CAD representation of said removable support formed on a CAD system into said support layer representations which comprise said support representation.

3D will likely rely on claim 46 and the doctrine of claim differentiation to argue that the construction of "support representation" cannot be limited to the use of horizontally-sliced support layers. "'[C]laim differentiation refers to the presumption that an independent claim should not be construed as requiring a limitation added by a dependent claim." *Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1380 (Fed. Cir. 2006). However, claim differentiation is of no avail to 3D. First, "claim differentiation is a guide, not a rigid rule," and it "cannot broaden claims beyond their correct scope. *Id*. at 1381 (citations omitted). Thus, claim differentiation cannot broaden the meaning of "supports" beyond "web supports." Second, claim differentiation is inapplicable because Defendants' construction does not render the scope of claim 46 the same as claim 28. Claim 46 recites "slicing a CAD representation." Defendants' construction does not limit the scope of claim 35 to a sliced "CAD representation." Moreover, "the written description and the prosecution history over come any presumption arising from the

doctrine of claim differentiation." *Andersen Corp.*, 2007 U.S. App. LEXIS 3108 at *19. Thus, claim differentiation does not trump the specification's clear indication--including in the Summary of *the Invention*--that a "support representation" is horizontally sliced.

5. "**Removable Support**"

The proper construction of this phrase is "**a structure that has a long, slender, rectangular cross-section, which is not part of the finished object, which provides reinforcement to the object or portions of the object and which is easily separated from the object**." As discussed in Section III.D.3, above, the specification of the '143 Patent limits the scope of the term "support" to "web supports," i.e., structures that in cross-section are long, slender and rectangular.

The Summary of the Invention also states that "The width of a web is designed to be thin enough to be *easy to remove* from the part after post curing." The '143 Patent at 6:54-56 (Exh. 5) (emphasis added). As the Background of the Invention indicates, even prior art supports were "removable" if enough force were applied, but "they were *hard to remove* from the object." *Id.* at 3:34-36 (emphasis added). Thus, the proper construction of "removable" is "easily separated."

3D's construction--"structure that is not part of the finished object which provides reinforcement to the object or portions of the object and is capable of being separated from the object"--fails to account for the specification's limitation of "supports" to web supports. It also defines "removable" as "capable of being separated." However, there is no basis in the specification for defining "removable" in this manner. To the contrary, the specification indicates that *all supports* are removable if enough force is applied. Thus, the Summary of the Invention characterizes "removable" as being easy to remove, and the phrase "removable

support" should be construed accordingly.

6. "**Formed in Said Spacing Out of a Materially Substantially Layer-By-Layer**"

This phrase should be construed to mean "**created in the space between the first and second surfaces by successively solidifying curable liquid sections of constant thickness**." As discussed above, in the '143 Patent, horizontally-sliced representations of the object and supports are created. These representations are then used to drive the layer-by-layer solidification process of drawing a radiation pattern on a curable liquid. For example, the Summary of the Invention states that after the object and support files are sliced and merged, "The SLA then forms the object one horizontal layer at a time . . . ." The '143 Patent at 6:19-20 (Exh. 5). "The first layer that is drawn by the SLA adheres to a horizontal platform just below the liquid surface." *Id*. at 6:28-30. "Normally, the bottom 0.25 inch or so of the object is a support structure on which the desired part is built." *Id*. at 6:41-42.

The '143 Patent consistently uses the term "layer" to refer to sections of constant thickness. For example, the Summary of the Invention refers to the "layer (slice) thickness," and the "selected layer thickness." *Id*. at 5:62-64 and 6:6-9. Figures 4 and 5, which were discussed with respect to the other paradigm patents, also depict layers 30a-30c as sections of constant thickness. *See also, Id.* at cols. 1355-1356 (stating that "Layer Thickness . . . Defines the vertical slice thickness in CAD units"). As discussed in Section III.A.5, above, dictionary definitions of the term "layer" also provide that it refers to a constant thickness.

3D's construction is "created in the space between the first and second surfaces by successive thicknesses of a building material." 3D's construction fails to account for the fact that a "layer" is a section of constant thickness, and therefore, that the claimed process of forming a

support "layer by layer" is necessarily limited to the formation of successive sections of the support, each of which has a constant thickness.

7. "**Thin**"

This term should be construed to mean "**not greater than 1-mil CAD (computer-aided design) thickness**." The '143 Patent does not provide an express definition of the word "thin." However, the specification states that "Web supports should be designed as slabs of 1-mil CAD thickness." The '143 Patent at 17:9-10 and cols. 1327-1328 (Exh. 5). According to the specification, the actual support may be thicker due to the width of the laser beam. However, the CAD thickness of the support should be 1-mil. *Id.*

3D's construction of "thin" is "substantially lesser in width than in length and easy to remove after the object is formed." First, nothing in the specification indicates that the thinness of the support's cross-sectional width is assessed *relative* to the support's length. Instead, the specification indicates that there is a critical thickness (1-mil) *regardless* of the support's length. Thus, there is no basis in the '143 Patent for defining "thin" in the relative manner suggested by 3D. Second, 3D's construction is vague and provides little guidance to the Court or jury, each of whom will be left to guess whether a given structure is "substantially lesser" in width than in length. In contrast, Defendants' construction is consistent with the specification's clear indication that supports should be no thinner than 1-mil CAD thickness.

8. "**Means for Receiving Said Support Representation, and for Forming Said Three-Dimensional Object Out of Said Medium, and also for Forming Said Support Out of Said Material Substantially Layer by Layer, In Accordance With Said Object and Support Representations**"

This phrase should be construed to include the following elements: **(1) a computer programmed to receive the data files representing the horizontally-sliced support sections of constant thickness and convert them to vectors, (2) a radiation beam that is configured to move across the surface of a curable liquid to sequentially solidify support sections of constant thickness by drawing a radiation pattern dictated by the vectors, (3) a curable liquid, (4) a control system for moving the source of radiation, and (5) a control system for moving the platform vertically**.

It is undisputed that this is a means-plus-function limitation and that it must be construed to encompass those disclosed structures and their structural equivalents which perform the claimed functions. The claimed functions are as follows:

--receiving the support representation;

--forming the three dimensional object out of the medium; and

--forming the support out of the material substantially layer by layer in accordance with the object and support representations.

According to 3D, this limitation should be construed to require a "computer control system, as well as the source of synergistic stimulation and the platform that moves the object." However, the relevant "structure" for purposes of construing a means-plus-function limitation is "the corresponding structure necessary to perform the function." *Gemstar-TV Guide International, Inc. et al., v. International Trade Commission, et al.,* 383 F.3d 1352, 1361 (Fed.

Cir. 2004). 3D has failed to identify the correct corresponding structure.

First, the structure that "receives the support representation" includes a computer that is programmed to receive the support files and convert them into vector files. *See WMS Gaming Inc. v. International Game Tech.,* 184 F.3d 1339, 1349 (Fed. Cir. 1999). In the embodiment of Figure 1, the "interface computer 4 generates layer data by slicing . . . ." The '143 Patent at 8:51-55 (Exh. 5). After creating vectors based on the sliced data, "The vector data and parameters from the computer 4 are directed to a controller subsystem 5 for operating the system stereolithography laser, mirrors, elevator and the like." *Id.* at 8:56-59. As illustrated in Figure 1-4, "supports are designed together in a single CAD file separate from the part file. The stereolithography files are the[n] sliced or cross-sectioned before being merged into one file." The '143 Patent at 17:22-25 (Exh. 5).

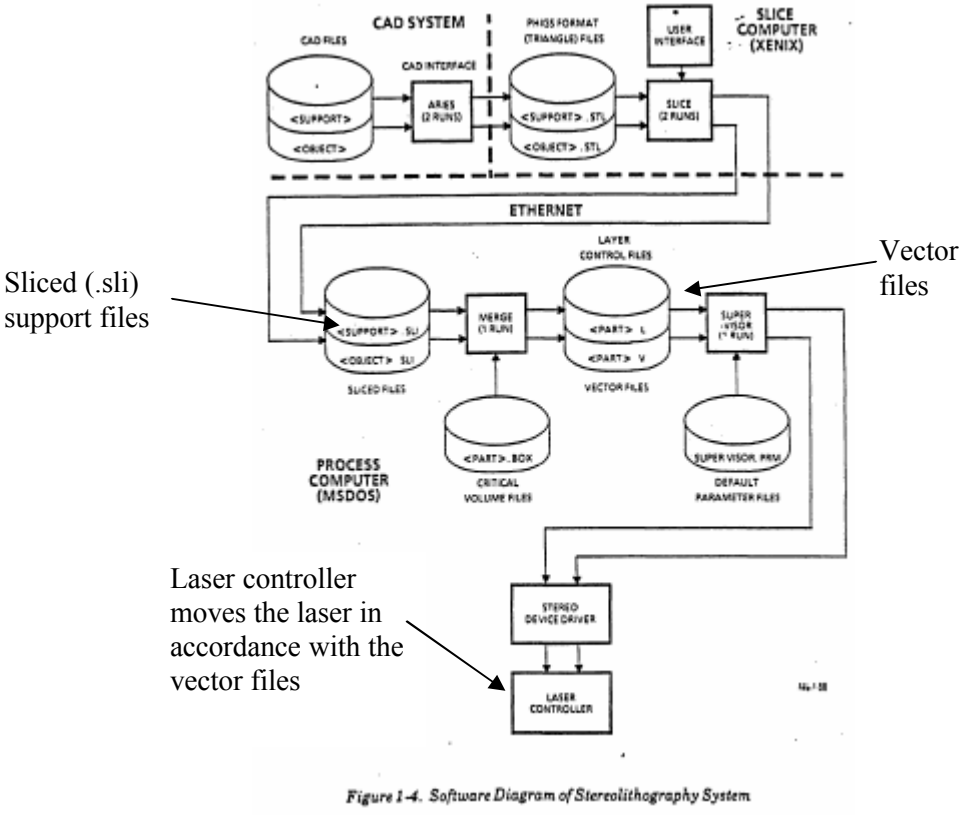


Figure 1-4. Software Diagram of Stereolithography System

The '143 Patent at cols. 57-58 (Exh. 5). As the figure indicates, the sliced representation of the supports is received by a process computer as a series of ".SLI" files. The support files are eventually converted to vector files that drive a laser controller. *See* Figure 1-2 at cols. 39-40, Items 6-7.

As explained in Section III.D.1, claim 35 is limited to "stereolithography," i.e., processes in which a radiation beam moves across the surface of a curable liquid to draw a radiation pattern. Thus, the corresponding structure for "forming said three-dimensional object" and "forming said support" is necessarily limited in scope to the use of a moving beam of radiation. Moreover, the only embodiments in the '143 Patent that specifically deal with support generation use a radiation beam that moves across the surface of the curable liquid. For example, the specification refers to Figure 6 as "an overall software architecture of a stereolithography system in which the present invention may be present," and Figure 6 specifically references the use of a moving radiation beam (laser):

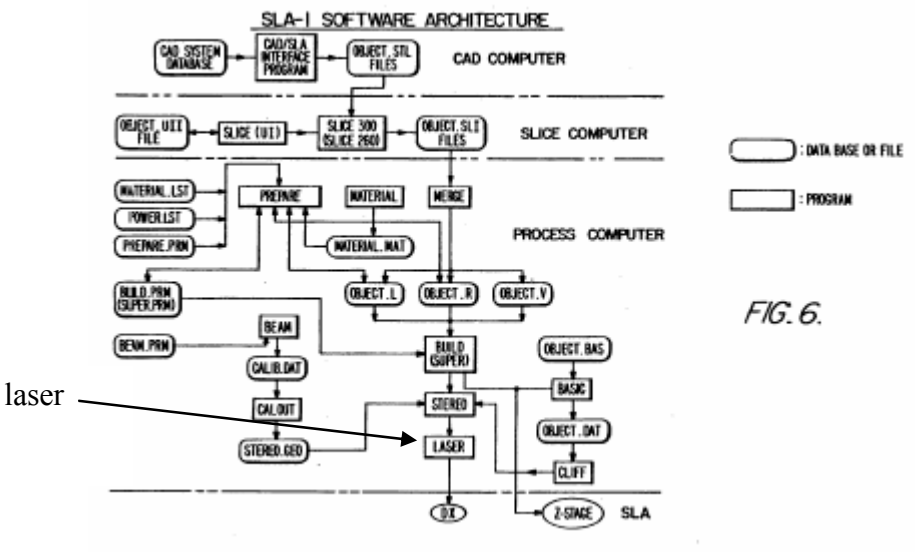


FIG. 6.

While the Summary of the Invention mentions other forms of "synergistic stimulation,"

nowhere does the '143 Patent describe the use of forms of "synergistic stimulation" other than moving radiation beams to form *supports*. *See also* the '143 Patent, Figure 1-1, cols. 39-40 (Exh 5). In addition, as the foregoing figures indicate, a control system is needed to move the source of radiation and the platform. *See Id.* at 11:65-67 ("A movable elevator platform 29 inside container 21 can be moved up and down selectively, the position of the platform being controlled by the system 28"). The curable liquid and a container are also required. *Id.* at 11:48-49 ("A container 21 is filled with a UV curable liquid 22 . . . ."). 3D's construction would require an unspecified "computer control system." However, the structure corresponding to the claimed function is a specific control system that directs the movement of a radiation beam across the surface of the curable liquid, as well as a control system to move the platform vertically.

9. "**Means for Forming Said Object Substantially Layer by Layer"**

This phrase should be construed to include the following elements: **(1) a computer programmed to convert data files containing horizontally sliced object sections of constant thickness to vectors, (2) a radiation beam that is configured to move across the surface of a curable liquid to sequentially solidify object sections of constant thickness by drawing a radiation pattern dictated by the vectors, (3) a curable liquid, (4) a control system for moving the source of radiation, and (5) a control system for moving the platform vertically**.

This limitation is the dependent claim limitation recited in claim 35. The previous limitations are recited in claim 28, the independent claim from which claim 35 depends. As discussed in Section III.D.1 and in Section III.D.7, claim 35 is directed to stereolithography. Thus, as with support formation, the structure that corresponds to the function of "forming said object" necessarily includes a beam of radiation that moves across the surface of the liquid to

draw a radiation pattern, the controller that moves the radiation beam, the curable liquid, container, platform, and platform controller. *See* the '143 Patent, Figure 4, Figure 6, Figure 1-1 (cols. 39-40), Figure 1-2 (cols. 45-46), Figure 1-3 (cols. 49-50), Figure 1-4 (cols. 57-58) (Exh. 5). The added recitation of "means for forming said object substantially *layer by layer*" in claim 35 additionally requires a computer that is programmed to convert the sliced data representation of the *object* and convert it into vectors that drive the moving source of radiation, as shown in Figure 1-4. *Id*. at cols. 57-58 (Exh. 5). In all embodiments of the '143 Patent, data files representing horizontally-sliced object sections of constant thickness are converted to vectors that drive the movement of the radiation beam. No other techniques for using object representations to form a solid object are described. Thus, the structure corresponding to the "means for forming the object substantially layer-by-layer," must include a computer programmed to convert the sliced object sections to vectors. *WMS Gaming, Inc. v. International Game Technology*, 184 F.3d 1339, 1349 (Fed. Cir. 1999).

CONCLUSION

For the reasons provided above, the Court should adopt Defendants' constructions in their entirety.

Dated: March 7, 2007

ENVISIONTEC, INC., ENVISIONTEC GMBH and SIBCO, INC.

s/R. Terrance Rader

R. Terrance Rader (P28747)
Steven R. Hansen (P69144)
RADER FISHMAN & GRAUER PLLC
39533 Woodward Avenue, Suite 140
Bloomfield Hills, MI 48304
Tel: 248-594-0600/ Fax: 248-594-0610
Email: rtr@raderfishman.com

Attorneys for Defendants

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CERTIFICATE OF SERVICE

I hereby certify that on March 7, 2007, I electronically filed the foregoing paper with the Clerk of the Court using the ECF system which will send notification of such filing to the following: Susan M. Kornfield and Alan M. Harris, and I hereby certify that I have served the foregoing paper via Federal Express on the following non-ECF participants:

Sidney David
Stephen B. Goldman
Samantha M. Kameros
LERNER, DAVID, LITTENBERG,
KRUMHOLZ & MENTLIK, LLP
600 South Avenue West
Westfield, NJ 07090-1497

s/R. Terrance Rader

R. Terrance Rader (P28747)
RADER FISHMAN & GRAUER PLLC
39533 Woodward Avenue, Suite 140
Bloomfield Hills, MI 48304
Tel: 248-594-0600
Fax: 248-594-0610
Email: rtr@raderfishman.com